

(Serial)

research and development in industry: 1985-86

funds, 1985-86
scientists & engineers,
Jan. 1986 - Jan. 1987

Am
pub 93023779

R+R 93000967



surveys of science resources series
national science foundation

detailed statistical tables

NSF 89-316

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Suggested Citation

National Science Foundation, Research and Development in Industry: 1985-86, NSF 89-316, Detailed Statistical Tables, available in paper copy and on diskette (Washington, D. C., 1989).

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GENERAL NOTES

- o Data in this report were collected by the Bureau of the Census (Census) for the National Science Foundation (NSF) in the Annual Survey of Industrial Research and Development and cover the periods 1956-86 funding data and January 1957-January 1987 for personnel data.
- o Footnote are used to indicate that data are being withheld for either two reason:
 - o To avoid the possible disclosure of information about the operations of individual companies. This occurs when a small number of companies, usually one or two, accounts for a large percentage of the R&D funds or scientists and engineers of a particular data cell. Data showing Federal R&D support to companies in R&D-performing industries are most often affected by this rule; or,
 - o To indicate that the imputation rate--the percentage of the statistic that is estimated by Census--exceeds 50 percent. This means that respondents have failed to provide data for that item on the questionnaire. Users should consult table A-1 for imputation rates for specific items.
- o The industry survey does not cover trade associations. Although their primary mission is to serve industry, trade associations are established as nonprofit organizations and are included in the NSF nonprofit survey. Research and development (R&D) expenditures of trade associations are estimated at less than 1 percent of the industry R&D total.
- o Complete technical notes are contained in section A. Questions regarding these survey findings should be addressed to Melissa Pollak or Mary Burke, Industry Studies Group, Division of Science Resources Studies, National Science Foundation, Washington, D. C. 20550 (202) 634-4648.

SECTION A. TECHNICAL NOTES

- o The annual Survey of Industrial Research and Development has been conducted for the National Science Foundation (NSF) by the U.S. Bureau of the Census for the past 30 years.
- o All companies, both foreign and domestic, that perform R&D in the United States are included or represented.
- o All companies in the United States that annually spend more than \$1 million on R&D receive a survey form every year.
- o Privately held companies are included.
- o Respondents are provided detailed definitions to guide them on which expenses to include or exclude from the R&D data they provide.
- o Census staff conduct the survey under Title 13 of the U.S. code which prohibits publication or release of data that may reveal information about individual companies.
- o It is a company- rather than an establishment-based survey. Therefore, all R&D data for each company are placed within the major SIC code of the firm for all tables, except those showing R&D expenditures by product field.

Introduction

NSF first sponsored a survey of industrial research and development (R&D) in 1953. Since then, the scope of the survey has gradually been expanded and refined in response to an increasing need for more detailed information on the Nation's R&D effort.

The 1986 survey of industrial R&D is the 30th in the annual series sponsored by NSF and conducted by the Bureau of the Census (Census), Department of Commerce. The Industry Studies Group of NSF's Division of Science Resources Studies monitors the survey. NSF also sponsored two industrial R&D surveys covering the 1953-56 period, which were conducted by the Bureau of Labor Statistics (BLS), Department of Labor.¹ Data obtained in the BLS survey are not directly comparable with the Census figures for 1957-86 because of methodological and other differences in the surveys conducted by the two agencies.

The primary focus of these data-gathering efforts is on U.S. industry as a performer of, rather than as a source of funds for, R&D. Thus, data on Federal support of R&D activities performed by industry are collected and appear in several tables, but data

on industry support of R&D undertaken at colleges and universities and other nonprofit organizations are not collected,^{2/} although they are included in a table showing the total amount of R&D funds contracted to outside organizations.

The statistics presented in this report are subject to response and concept errors that are caused by different interpretations of the definitions of R&D activities that are provided in the survey instructions and by variations in company accounting procedures. Consequently, the data are better indicators of changes in, rather than absolute levels of, R&D spending and personnel.

Data quality has improved substantially since the first industry R&D survey was undertaken, mainly as a result of respondents' adoption of more accurate and sophisticated accounting procedures. In addition, NSF and Census staff have endeavored to reduce response and concept errors arising from difficulties in interpreting or applying survey definitions.

NSF staff are aware of the increased reporting burden placed on industry from all sources in recent years. To reduce this burden, the detailed questionnaire, which has been in use with slight modifications since the beginning of the survey, is now mailed only biennially; an abbreviated form containing only the most crucial data elements is sent to survey respondents in the intervening years.

The shortened survey form was used for the first time to collect industrial R&D data for 1978. Because not all data elements were collected in even-numbered years, some historical tables do not contain data for these years, and other tables show prior-year, rather than current-year, data in even-numbered editions of this data series. The main tables affected are those that give detailed breakdowns of R&D expenditures for basic research, applied research, and development by industry (between 1978 and 1984)^{3/} and by product field. Tables showing company-financed R&D contracted to outside organizations, Federal R&D support to industry by agency, R&D expenditures by geographic area, and some detailed data on energy- and pollution-abatement R&D activities are also omitted in even-numbered years.

Survey Definitions^{4/}

Research and development--Basic and applied research in the sciences and engineering and the design and development of prototypes and processes. This definition excludes quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or

psychology, and other nontechnological activities or routine technical services.

Basic research--Original investigations for the advancement of scientific knowledge not having specific immediate commercial objectives, although such investigations may be in fields of present or potential interest to the reporting company.

Applied research--Investigations directed to the discovery of new scientific knowledge having specific commercial objectives with respect to products or processes. This definition differs from that of basic research chiefly in terms of the objectives of the reporting company.

Development--Technical activities of a nonroutine nature concerned with translating research findings or other scientific knowledge into products or processes. Not included are routine technical services to customers or other activities excluded from the foregoing definition of R&D.

Funds for research and development--Operating expenses incurred by a company in the conduct of R&D in its own laboratories or other company-owned or -operated facilities. These expenses include wages and salaries, materials and supplies consumed, property and other taxes, maintenance and repairs, depreciation, and an appropriate share of overhead, but exclude capital expenditures. All funds for R&D performance are expressed in current rather than constant dollars.

Company-financed research and development--Cost of the company-sponsored R&D performed within the company. These data do not include the cost of R&D contracted to outside organizations, such as research institutions, universities and colleges, nonprofit organizations, or [to avoid double-counting] other companies. Industrial firms that undertake R&D supported by other companies, however, do report the funds received in payment for the R&D work they perform. Those monies are classified under the industries of the performing companies.

Federally financed research and development--Receipts for work done by the company on Federal R&D contracts or subcontracts and R&D portions of procurement contracts and subcontracts.

Federally funded research and development centers (FFRDCs)--Organizations administered by industrial, educational, or other institutions on a nonprofit basis; they conduct R&D almost exclusively for the use of the Federal Government. R&D expenditures of industry-administered FFRDCs are included in data showing Federal R&D support to industry under the industry

classifications of the administering firms. See section C for a listing of industry-administered FFRDCs and their locations.

R&D scientists and engineers--The January number of those engaged full time in R&D and the full-time equivalent of those working part time in R&D. Scientists and engineers are defined as persons engaged in scientific or engineering work at a level that requires a knowledge of physical, life, engineering, or mathematical sciences equivalent at least to that acquired through completion of a 4-year college program with a major in one of those fields.

Employment--Total number of persons domestically employed by R&D-performing companies in all activities during the pay period that includes the 12th of March. These data are not completely comparable with the data on R&D scientists and engineers that were collected for January of each year.

Net sales and receipts--Recorded dollar values for goods sold or services rendered by R&D-performing companies to customers (outside the company), including the Federal Government, less such items as returns, allowances, freight, charges, and excise taxes. Domestic intracompany transfers and sales by foreign subsidiaries are excluded, but transfers to foreign subsidiaries and export sales to foreign companies are included.

Geographic area covered--Includes only those operations located in the 50 States and the District of Columbia.5/

Explanation of Tabular Data

Industry classification--Industries and industry groups cited in statistical tables are classified according to their Standard Industrial Classification (SIC) Manual6/ codes (with industry group code numbers shown in parentheses) as follows:

- Food and tobacco (20, 21)7/
- Textiles and apparel (22, 23)
- Lumber, wood products, and furniture (24, 25)
- Paper and allied products (26)
- Chemicals and allied products (28)
- Industrial chemicals (281-82, 286)8/
 - Drugs and medicines (283)
 - Other chemicals (284-85, 287-89)8/
- Petroleum refining (29)9/
- Rubber products (30)
- Stone, clay, and glass products (32)
- Primary metals (33)
 - Ferrous metals and products (331-32, 3398-99)
 - Nonferrous metals and products (333-36)

- Fabricated metal products (34)
- Machinery (35)
 - Office, computing, and accounting machines (357)
 - Other machinery, except electrical (351-56, 358-59)
- Electrical equipment (36)9/
 - Radio and TV receiving equipment (365)
 - Communication equipment (366)9/
 - Electronic components (367)
 - Other electrical equipment (361-64, 369)
- Motor vehicles and motor vehicles equipment (371)
- Other transportation equipment (373-75, 379)
- Aircraft and missiles (372, 376)10/
- Professional and scientific instruments (38)
 - Scientific and mechanical measuring instruments (381-82)
 - Optical, surgical, photographic, and other instruments (383-87)
- Other manufacturing industries7--printing and publishing (27), leather products (31), and miscellaneous manufacturing industries (39)
- Nonmanufacturing industries--agriculture, forestry, and fisheries (07-09); mining and extraction (10-14)9/; contract construction (15-17); transportation, communication, and other public utilities (41-49)8/; wholesale and retail trade (50-59); finance, insurance, and real estate (60-67); and selected service industries (739, 807, 891).

Company size-class--Companies are categorized by size as determined by the total number of their employees. The following are the six company size-classes used in this report: fewer than 500 employees; 500 to 999 employees; 1,000 to 4,999 employees; 5,000 to 9,999 employees; 10,000 to 24,999 employees; and 25,000 or more employees.

Classification of reporting units--The company or corporate family that includes all establishments under common ownership or control is the basic reporting unit. All of the R&D expenditures and scientists and engineers of each company are classified into a single SIC code and size-category.

Cost per R&D scientific or engineer--The number of R&D scientists and engineers used to estimate the cost per R&D scientist or engineer for 1957-86 is the arithmetic mean of the numbers of R&D scientists and engineers reported for January in two consecutive years. This number is then divided into total, earlier-year, R&D expenditures, and the ratio is attributed to the earlier year. For example, the mean of the numbers of R&D scientists and engineers in January 1986 and January 1987 is

divided into total 1986 R&D expenditures for a total cost per R&D scientist or engineer in 1986.

Nonavailability of statistics--Tables in section B contain footnotes used to indicate that data are being withheld for either two reasons:

- o To avoid the possible disclosure of information about the operations of individual companies. This occurs when a small number of companies, usually one or two, accounts for a large percentage of the R&D funds or scientists and engineers of a particular data cell. Data showing Federal R&D support to companies in R&D-performing industries are most often affected by this rule; or,
- o To indicate that the imputation rate--the percentage of the statistic that is estimated by Census--exceeds 50 percent. This means that respondents have failed to provide data for that item on the questionnaire. Users should consult table A-1 for imputation rates for specific items.

Withheld data are always included in totals. In some instances, data withheld because of high imputation rates can be derived by subtraction from higher-level totals. In such cases, the data user should be aware that the derived numbers are statistically unreliable. In no instance can data be derived that would disclose operations of individual companies.

Method of computation--Because of rounding, detailed statistics in the tables may not add to totals or subtotals. Also, percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.

Methodology of Survey¹¹/

Data presented in this report are based on a probability sample, selected and first used for survey year 1981.¹² The universe from which the probability sample, or "the panel," was drawn includes all manufacturing industries and a select number of nonmanufacturing industries known, on the basis of earlier samples, to conduct R&D. The sampling unit for this survey is the company, defined as a business organization consisting of one or more establishments under common ownership or control.

The universe frame from which the sample panel was selected was created from two sources: The 1981 Standard Statistical Establishment List (SSEL) and the 1981 Enterprise Statistics File. The former contains about 3.5 to 4.0 million single-

Table A-1. Imputation rates for selected items on the research and development survey by industry: 1986

(Percent)

Industry	SIC code	Total R&D			Total	Com- pany	Fed- eral	Energy R&D	Pollu- tion abate- ment	For- eign R&D
		Sales	Em- ploy- ment	Scientists/ engineers						
Total.....		7.4	10.7	35.8	3.5	4.7	1.2	24.5	60.2	15.4
Distribution by industry										
Food and kindred products.....	20	8.6	8.4	55.5	6.7	6.7	0.0	0.0	3.2	0.0
Textiles and apparel.....	22,23	14.2	19.9	39.7	35.3	44.1	4.9	49.5	0.0	0.0
Lumber, wood products, and furniture.....	24,25	16.3	27.0	67.1	7.9	8.7	0.0	98.7	0.0	87.7
Paper and allied products.....	26	12.8	11.4	19.7	5.3	5.3	0.0	70.3	3.6	5.8
Chemicals and allied products.....	28	9.4	4.1	41.2	2.2	2.3	0.0	72.3	47.7	18.7
Industrial chemicals.....	281-82,286	12.2	2.7	42.8	1.0	1.0	0.0	80.5	55.4	22.1
Drugs and medicines.....	283	1.9	2.0	43.6	1.5	1.5	0.0	0.4	13.9	17.2
Other chemicals.....	284-85,287-89	10.8	9.3	29.7	9.0	9.0	-	0.0	9.9	15.2
Petroleum refining and related industries	29	0.0	0.1	35.2	0.1	0.1	0.0	25.6	1.5	0.5
Rubber products.....	30	11.9	14.0	70.9	8.8	12.1	0.0	81.4	33.9	1.7
Stone, clay, and glass products.....	32	13.0	11.6	36.2	2.2	2.5	0.0	0.7	0.0	5.0
Primary metals.....	33	14.8	17.8	24.4	9.2	16.4	0.4	48.7	0.0	66.9
Ferrous metals and products.....	331-32,3398-99	16.1	19.4	18.2	8.7	22.2	0.4	13.5	0.0	91.6
Nonferrous metals and products.....	333-36	11.9	14.0	42.6	10.2	11.0	0.0	62.6	0.0	17.2
Fabricated metal products.....	34	31.6	25.5	54.1	16.4	18.8	0.0	0.0	0.0	1.4
Machinery.....	35	4.9	9.8	19.8	5.8	6.6	0.7	1.1	0.0	0.3
Office, computing, and accounting machines.....	357	3.0	10.6	15.5	5.9	6.9	0.3	0.0	0.0	0.0
Other machinery, except electrical.....	351-36,358-59	6.2	9.0	30.1	5.6	5.6	4.9	1.3	0.0	2.2
Electrical equipment.....	36	4.8	9.4	32.0	5.5	6.8	3.7	0.1	0.0	69.6
Radio and TV receiving equipment.....	365	4.9	3.1	31.5	6.4	6.7	0.0	-	-	0.0
Communication equipment.....	366	0.9	10.6	32.3	8.3	9.1	7.2	0.0	0.0	96.2
Electronic components.....	367	18.1	17.3	48.1	5.9	7.1	0.7	0.0	0.0	4.5
Other electrical equipment.....	361-64,369	3.5	4.2	14.6	0.9	2.0	0.0	0.2	0.0	0.0
Transportation equipment.....	37	1.5	2.7	32.1	0.3	0.6	0.1	59.8	80.9	0.8
Motor vehicles and motor vehicles equipment.....	371	1.2	2.2	37.3	0.3	0.2	0.1	97.8	88.4	0.0
Other transportation equipment.....	373-75,379	10.5	13.2	92.8	3.4	6.1	0.0	0.0	0.0	0.0
Aircraft and missiles.....	372,376	1.4	2.0	27.7	0.4	1.2	0.1	23.9	11.0	0.2
Professional and scientific instruments..	38	5.4	6.1	63.3	3.5	4.1	0.5	0.3	4.1	1.9
Scientific and mechanical measuring instruments.....	381-82	6.1	7.0	73.1	4.4	5.7	0.5	0.3	8.1	12.9
Optical, surgical, photographic, and other instruments.....	383-87	4.8	5.3	46.2	2.7	2.9	0.6	0.0	0.0	0.8
Other manufacturing industries.....	21,27,31,39	22.8	28.6	66.0	13.6	14.3	0.0	0.0	0.0	0.6
Nonmanufacturing industries.....	87-17,41-67, 737,739,807,391	7.6	15.3	31.2	5.3	10.5	1.8	1.6	18.7	6.2

- Represents no basis for imputation.

SOURCE: U.S. Department of Commerce, Bureau of the Census

establishment firms, and the latter contains 5.6 million multi-establishment companies. From these two sources, 427,737 companies were identified as "in scope" (in manufacturing or selected nonmanufacturing industries) of the survey and therefore became the universe frame--105,407 were multiestablishment and 322,330 were single-establishment companies.

Number of companies in the universe frame

Companies	Total	Manufacturing industries	Nonmanufacturing industries
Total.....	427,737	267,223	160,514
Multiestablishment	105,407	18,141	87,266
Single-establishment	322,330	249,082	73,248

All companies in the universe frame with 500 or more employees were sampled with certainty. These companies are called "arbitrary certainties" and are self-representing, i.e., they have sampling weights of unity (1.00). In all, 5,818 (479 single-establishment and 5,339 multiestablishment) companies were arbitrary certainties.

The remaining companies (421,919) in the universe frame--those with fewer than 500 employees--were sampled. Each company was assigned a probability of selection, based on the size of its estimated R&D expenditures. The size of each company's R&D expenditures was estimated using a relationship [developed for each SIC] linking the size of its R&D expenditures to its employment. Thus, within each SIC, the larger the number of employees, the higher the probability of selection for inclusion in the sample.

The universe frame was divided into seven separate frames for single-establishment and for multiestablishment companies. These 14 frames were constructed from groups of SIC codes. [SIC codes had been assigned to each company within the SSEL and Enterprise Statistics Files.] The amount of funds provided by NSF determined the size of the sample--12,000 companies--to be drawn. A sampling operation was then performed separately for each of the 14 frames to select those 12,000 companies. [This procedure ensured a more equitable distribution of the sample across SIC codes than would have occurred had the sampling been performed on the entire frame.] Each company had an independent chance of selection based on its assigned probability; the selection [or nonselection] of a company was completely independent of the selection of any other company.^{13/} In all,

12,730 companies were selected--5,818 of these were the arbitrary certainties mentioned above and 6,912 (2,656 multi-establishment and 4,256 single-establishment) were chosen from among the companies in the universe frame that had fewer than 500 employees.

Number of companies in the sample

Companies	Total	500 or more employees	<500 employees
Total.....	12,730	5,818	6,912
Multiestablishment.....	5,339	2,656	7,995
Single-establishment.....	479	4,256	4,735

Each company in the panel was assigned a sampling weight equal to the reciprocal of its probability of selection. It should be noted that there are certainty companies (sampling weight = 1.00) other than arbitrary certainties in the panel. Although these companies have fewer than 500 employees, they became "analytical" certainties because the specified size of the sample caused some of the larger companies in the 14 frames to be selected with certainty. Of the 2,656 multiestablishment and 4,256 single-establishment companies, 324 and 53, respectively, were analytical certainties for this reason.

The basic tool for the survey is Form RD-1, which is used to collect detailed R&D information. Companies in the new panel that had received an RD-1 form in the old panel once again received an RD-1 form in 1981--about 1,280 companies. The remaining certainty (4,915) and noncertainty (6,535) companies in the new panel received an RD-1A survey form for 1981. Form RD-1A is an abbreviated version of RD-1 and is generally mailed to companies only in the year in which a new sample is drawn. Its purpose is to canvass, with a minimum of reporting burden, smaller R&D performers. Once the RD-1A forms were received and tabulated from the survey respondents in 1981, they were reviewed for total R&D expenditures. Companies that had reported R&D expenditures exceeding \$1,000,000 on the RD-1A form were added to the survey panel consisting of firms that receive the RD-1 form annually--about 575 such companies in 1981. Data for the remaining RD-1A companies in subsequent years were estimated by Census on the basis of the companies' 1981 reports.

Census staff reviewed lists of R&D contractors published by the Department of Defense (DOD) and the National Aeronautics and

Space Administration (NASA) to ensure that all large contractors had been included in the sample. R&D-performing manufacturing companies from the largest DOD and NASA contractors were included in the reporting panel with certainty.

The particular sample selected is one of a large number of samples of the same type and size that, by chance, might have been selected. Estimates from each of the different samples would differ somewhat from each other and from the results of a complete canvass conducted under essentially the same conditions as the survey. This variation among the possible estimates is defined by the sampling error, measured in standard error units. The complete canvass total would be included in the range--(1) from one standard error below to one standard error above the derived estimate for about two-thirds of all possible samples; (2) from two standard errors below to two standard errors above the derived estimate for about 95 percent of all possible samples; and (3) from three standard errors below to three standard errors above the derived estimate, almost always.

An inference that the comparable complete canvass total would be within the indicated ranges would be correct in approximately the relative frequencies shown. Those proportions, therefore, may be interpreted as defining the confidence that the estimates from a particular sample would differ from complete coverage results by as much as one, two, or three standard errors, respectively.

For example, suppose an estimated total is shown as 400 with an associated relative standard error of 2 percent. Then, there is approximately 67-percent confidence that the interval 392 to 408 includes the complete canvass total, about 95-percent confidence that the interval 384 to 416 includes the complete canvas total, and almost certain confidence that the interval 376 to 424 includes the complete canvass total.

Estimation

In addition to sampling errors, the estimates are subject to nonsampling errors that would also occur if the universe were surveyed under the same conditions. This includes errors due to response, coding, processing, and imputation for nonresponse. These nonsampling errors would also occur if a complete canvass were to be conducted under the same conditions as the survey (table A-2).

The survey questionnaires were mailed in January 1987, and nonrespondents received followup letters by mail. Since total R&D expenditures, Federal R&D funds, net sales, and employment are included in Census' mandatory statistical program, Form MA-

Table A-2. Standard error of estimate (percentage) of funds for R&D performance for all company size-groups and for companies with fewer than 1,000 employees by industry: 1986

Industry	SIC code	Standard error(1)	Standard error of companies with fewer than 1,000 employees
Total.....		1	12
Food, kindred, and tobacco products.....	20,21	0	22
Textiles and apparel.....	22,23	3	29
Lumber, wood products, and furniture.....	24,25	1	19
Paper and allied products.....	26	1	39
Chemicals and allied products.....	28	1	9
Industrial chemicals.....	281-82,286	0	14
Drugs and medicines.....	283	3	21
Other chemicals.....	284-85,287-89	1	12
Petroleum refining	29	0	17
Rubber products.....	30	4	38
Stone, clay, and glass products.....	32	1	20
Primary metals.....	33	2	31
Ferrous metals and products.....	331-32,3398-99	1	39
Nonferrous metals and products.....	333-36	6	43
Fabricated metal products.....	34	3	20
Machinery.....	35	1	20
Office, computing, and accounting machines.....	357	1	18
Other machinery, except electrical.....	351-56,358-59	5	29
Electrical equipment.....	36	0	10
Radio and TV receiving equipment.....	365	10	29
Communication equipment.....	366	0	15
Electronic components.....	367	2	24
Other electrical equipment.....	361-64,369	1	14
Transportation equipment.....	37	1	70
Motor vehicles and motor vehicles equipment.....	371	0	36
Other transportation equipment.....	373-75,379	0	7
Aircraft and missiles.....	372,376	1	75
Professional and scientific instruments.....	38	1	13
Scientific and mechanical measuring instruments....	381-82	2	19
Optical, surgical, photographic, and other instruments.....	383-87	1	17
Other manufacturing industries.....	27,31,39	4	32
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	11	39

(1) A description of the standard error of estimate is given in the Technical Notes accompanying these tables. The percentage (or relative) standard errors in this table may be converted to standard errors of estimate by multiplying the percentage shown by the associated estimate. For example, the relative standard error of estimate for R&D performance for all company size groups in the machinery industry (SIC 35) is shown as 1 percent, and the associated total R&D estimate for this industry for 1986 is shown as \$10,696 million. The standard error of estimate, then, is .01 times 10,696 or 106.96.

SOURCE: U.S. Department of Commerce, Bureau of the Census

121s, which are used to collect these mandatory items, were mailed to the few companies that had not returned Form RD-1 for 1986.

When companies fail to provide the requested information, the missing data are estimated by using industry averages and several different methodologies that rely on data provided in earlier years. Table A-1 contains imputation rates for the principal survey items.

Comparability of Data over a Period of Several Years

Several procedures are undertaken to maintain the reliability of the industry R&D time series:

Two-Year Comparability

Before mailing the survey forms each year, data reported by respondents the previous year--or two years earlier for items asked only in odd-numbered years--are imprinted on the questionnaires. Respondents are asked to adjust data for the previous year(s) as necessary to make them comparable to data provided for the current year. Such adjustments are necessitated, for example, by changes in reporting concepts or changes in company structure such as mergers, acquisitions, or divestitures. Thus, there is comparability in data from the survey over any 2-year period. To maintain consistency, the employment-size classification of any company affected by such changes was adjusted so that the company is tabulated in the same employment-size category for two consecutive years.

These adjustments can be examined by comparing data for the same year reported in two succeeding periods, e.g., 1984 data appearing in the 1984 edition of Research and Development in Industry may differ from those in this volume. Totals for broad classifications are likely to be very close in the two editions; larger differences are more noticeable in the finer detail. These differences underscore the point that the measures are approximate and indicative rather than precise.

Historical Data Revisions

The industry R&D survey data are revised periodically, usually because of changes in company SIC classifications. Although the industry classifications of most companies in the survey have not changed, occasionally a company shifts from one industry into another because of any of the following: (1) the growth and/or decline of product lines, (2) the merger of two or more companies, (3) the acquisition of one company by another, (4) divestiture, or (5) the formation of conglomerates. If Census Bureau staff are aware of the year in which changes #2,

#3, #4, or #5 occurred (respondents are asked about changes in ownership on the questionnaire), data are reclassified in the new industry for the year the change actually occurred. If Census staff did not discover a change until the selection of a new panel or if it could not be determined when a shift actually occurred (i.e. #1), other methodologies were used to move a

company out of one industry and into another. Since 1967, two revisions in the data covering the periods 1967-76 and 1976-81 were made to adjust the data of companies that changed industries. These are described below.

The 1967-76 Period

The SIC codes assigned to companies in the panel for the years 1967 through 1975 were based upon data reported in the 1967 census.^{14/} The 1974 SSEL file was used to assign SIC codes to companies in the next panel chosen for the 1976 survey and for revised 1975 data received in the 1976 survey. The SIC codes of companies in the 1967 and 1976 panels were examined to determine which companies had changed classifications. Since it was not known in which year changes actually occurred, data of companies that had changed SIC codes were revised for the years 1968 through 1974 to smooth the changes over the period 1967-76. To illustrate, if a company was originally in SIC A in 1967 but was discovered to be in SIC B in 1974, its data for 1967-74 were allocated between the two industries as follows: 1967--all of the company's data was retained in industry A; 1968--14.3 percent of the company's data was allocated to industry B, and the remainder retained in industry A; 1969--28.6 percent was allocated to industry B, and the remainder retained in industry A; and so on until 1974, when all of the company's data was allocated to industry B.

The 1976-81 Period

A similar revision in the industry R&D data was made for companies in the panel drawn in 1976 and used for the years 1976-80, but a different methodology was used.

When the most recent panel (1981) was selected, companies were assigned SIC codes from the 1981 SSEL and 1981 Enterprise Files. Prior-period (1980) data were collected in the 1981 survey. These 1980 data were presumed to be more accurate than those collected in the 1980 survey because they not only reflected updated SIC codes, but also were obtained from a larger panel providing better coverage of U.S. industry. Thus data obtained for 1976-80 using the panel selected in 1976 were revised subject to the following constraints:

1. Data for 1976 (revised from the 1977 survey) would remain unchanged since this was the first year the 1976 panel was used and that panel was an accurate reflection of company SIC codes in that year.
2. Data for 1980 collected in the 1981 survey would be used instead of the 1980 data collected in the 1980 survey.

An algorithm was used to link data from 1976 with those collected in 1981, preserving, to the greatest extent possible, year-to-year trends in data for each industry by revising data for the years 1977, 1978, and 1979.

The following data elements were adjusted using the methodologies just described: Funds spent on R&D (total, Federal, and companies' own); number of full-time-equivalent (FTE) R&D scientists and engineers; total and company R&D funds as a percent of net sales; cost per R&D scientist or engineer; and basic research expenditures. No adjustments were made in other data elements.

Footnotes

- 1/ National Science Foundation, Science and Engineering in American Industry. Final Report on a 1953-54 Survey (NSF 56-16) and Science and Engineering in American Industry, 1956 (NSF 59-50) (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office, 1956 and 1960).
- 2/ Data on industry funding of R&D performed at universities and colleges are collected in the annual Survey of Scientific and Engineering Expenditures at Universities and Colleges. More information about this survey is available from the Universities and Colleges Studies Group of NSF's Division of Science Resources Studies.
- 3/ Beginning in 1984, annual collection of basic research, applied research, and development data was resumed.
- 4/ For more detailed definitions, as well as the instructions for individual items covered in the survey questionnaire, see section D.
- 5/ Company-sponsored R&D performed outside the United States by foreign subsidiaries of U.S. domestic companies is reported in table B-11 but excluded from all other tables.
- 6/ Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual, 1972 (Washington, D.C.: Supt. of Documents, U.S. Government Printing Office).
- 7/ Until 1984, tobacco products (SIC 21) was included with "other manufacturing industries."
- 8/ The classification "Industrial chemicals" was revised to include SIC Group 286, Industrial organic chemicals. All current and historical tables were revised accordingly.
- 9/ Starting with the 1978 survey, oil and gas extraction (13) was no longer grouped with petroleum refining (29), and communication (48) was no longer grouped with electrical equipment (36). Instead, firms in these SIC groups may have been included in the nonmanufacturing and nonmanufacturing industries more consistent. This change had almost no effect on the levels of the R&D data. It is likely that communication companies will be reclassified when a new sample is drawn for the 1987 survey.
- 10/ Companies primarily engaged in the manufacture of ordnance and accessories, including complete guided missiles, are grouped with companies primarily engaged in the manufacture of aircraft and parts because of the close similarity of their R&D activities.

SECTION B. DETAILED STATISTICAL TABLES

In all tables of this report:

- o Because of rounding, components may not add to totals.
 - o Percentages were calculated on the basis of thousands of dollars and may differ from those based on the rounded figures shown.
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Table B-1. Trends in funds for industrial research and development by source: 1953-89 (estimated)

[Dollars in millions]

Year	Total R&D		Federal		Company(1)	
	Current dollars	Constant 1982 dollars	Current dollars	Constant 1982 dollars	Current dollars	Constant 1982 dollars
1953.....	63,630	914,021	61,430	85,523	82,200	88,497
1954.....	4,070	15,475	1,750	6,654	2,320	8,821
1955.....	4,640	17,090	2,180	8,029	2,460	9,061
1956.....	6,605	23,530	3,328	11,656	3,277	11,674
1957.....	7,731	26,585	4,335	14,907	3,396	11,678
1958.....	8,389	28,274	4,759	16,040	3,630	12,235
1959.....	9,618	31,597	5,635	18,512	3,983	13,085
1960.....	10,509	33,955	6,081	19,648	4,428	14,307
1961.....	10,908	34,917	6,240	19,974	4,668	14,942
1962.....	11,464	35,892	6,434	20,144	5,029	15,745
1963.....	12,630	38,981	7,270	22,438	5,360	16,543
1964.....	13,512	41,032	7,720	23,444	5,792	17,589
1965.....	14,185	41,992	7,740	22,913	6,445	19,079
1966.....	15,548	44,474	8,332	23,833	7,216	20,641
1967.....	16,385	45,590	8,365	23,275	8,020	22,315
1968.....	17,429	46,194	8,560	22,688	8,869	23,506
1969.....	18,308	46,023	8,451	21,244	9,857	24,779
1970.....	18,067	42,986	7,779	18,508	10,288	24,478
1971.....	18,320	41,200	7,666	17,274	10,654	24,006
1972.....	19,552	42,056	8,017	17,245	11,535	24,812
1973.....	21,249	42,893	8,145	16,441	13,104	26,451
1974.....	22,887	42,415	8,220	15,234	14,667	27,181
1975.....	24,187	40,781	8,605	14,509	15,582	26,272
1976.....	26,997	42,805	9,561	15,159	17,436	27,645
1977.....	29,825	44,330	10,485	15,584	19,340	28,746
1978.....	33,304	46,115	11,189	15,493	22,115	30,622
1979.....	38,226	48,652	12,518	15,952	25,708	32,720
1980.....	44,505	51,919	14,029	16,366	30,476	35,553
1981.....	51,810	55,140	16,382	17,435	35,428	37,705
1982.....	57,996	57,996	18,483	18,483	39,512	39,512
1983.....	63,403	61,047	20,542	19,779	42,861	41,268
1984.....	71,460	66,332	23,162	21,500	48,298	44,832
1985.....	78,268	70,544	26,830	24,182	51,439	46,362
1986.....	80,629	70,771	27,782	24,385	52,847	46,385
1987 (preliminary).....	84,600	71,896	30,000	25,495	54,600	46,401
1988 (NSF estimate).....	89,600	73,927	31,500	25,990	58,100	47,937
1989 (NSF estimate).....	94,150	74,788	32,750	26,015	61,400	48,773

(1) Company funds include all funds for industrial R&D work performed within company facilities except funds provided by the Federal Government. Excluded are company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other nonprofit organizations.

NOTE: NSF estimates are published in National Science Foundation, National Patterns of R&D Resources, 1989 (NSF 89-308). The 1982 GNP implicit price deflator was used to convert current to constant dollars.

SOURCE: National Science Foundation, SRS

Table B-2. Selected data for companies performing research and development by industry: 1984-86

Industry(1)	SIC code	[Dollars in millions]								
		Total R&D funds			Federal R&D funds			Company R&D funds		
		1984	1985	1986	1984	1985	1986	1984	1985	1986
Total.....		\$71,460	\$78,268	\$80,629	\$23,162	\$26,830	\$27,782	\$48,298	\$51,439	\$52,847
Food and kindred products.....	20	(2)	(2)	(2)	(2)	(2)	(2)	(2)	782	(2)
Tobacco manufactures.....	21	(2)	(2)	(2)	0	0	0	(2)	213	(2)
Textile mill products.....	22	(2)	(2)	(2)	(2)	(2)	(2)	108	124	(2)
Apparel.....	23	(2)	(2)	28	(2)	(2)	(2)	31	28	(2)
Lumber and wood products, except furniture.....	24	90	82	(2)	0	0	(2)	90	82	74
Furniture and fixtures.....	25	91	90	102	0	0	0	91	90	102
Paper and allied products.....	26	(2)	(2)	(2)	(2)	(2)	(2)	802	859	887
Printing, publishing, and allied industries.....	27	119	(2)	(2)	0	(2)	(2)	119	166	159
Chemicals and allied products.....	28	8,028	8,690	9,021	232	299	248	7,797	8,391	8,773
Petroleum refining.....	29	(2)	(2)	(2)	(2)	(2)	(2)	2,173	2,101	1,867
Rubber products.....	30	(2)	(2)	1,075	(2)	(2)	300	884	801	776
Leather and leather products.....	31	17	(3)	(2)	0	0	(2)	17	(3)	15
Stone, clay, and glass products.....	32	(2)	(2)	(2)	(2)	(2)	(2)	476	488	489
Primary metals.....	33	(2)	(2)	(2)	(2)	(2)	(2)	709	753	809
Fabricated metal products.....	34	716	628	622	61	41	78	654	585	544
Machinery.....	35	9,667	10,853	10,696	1,216	1,536	1,456	8,452	9,317	9,239
Electrical equipment.....	36	15,694	17,055	18,030	5,956	7,032	7,569	9,738	10,023	10,460
Transportation.....	37	(2)	(2)	26,371	(2)	(2)	14,841	9,370	10,538	11,530
Professional and scientific instruments.....	38	4,840	5,303	5,421	660	787	844	4,180	4,516	4,576
Miscellaneous manufacturing industries.....	39	(2)	(2)	(2)	(2)	(2)	(2)	237	180	208
Electric, gas, and sanitary services.....	49	183	(2)	(2)	40	(2)	(2)	143	121	140
Miscellaneous business services.....	73	1,353	1,383	1,393	744	1,025	1,108	608	558	285
Miscellaneous services.....	89	159	(2)	(2)	64	(2)	(2)	95	48	48
10-17, 41-48, 50-67										
Other nonmanufacturing industries.....	807	890	1,043	1,017	366	386	391	524	658	626

(1) Industries, industry groups, and product fields shown separately in statistical tables are classified according to Standard Industrial Classification (SIC) manual codes.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of more than 50 percent.

Source: National Science Foundation, SRS

Table B-2. Selected data for companies performing research and development by industry: 1984-86 (continued)

Industry(1)	SIC code	Net sales			R&D scientists and engineers January			Total employment (in thousands)		
		1984	1985	1986	1985	1986	1987	1984	1985	1986
Total.....		\$2,004,507	\$1,949,752	\$1,886,975	560,100	583,099	584,481	15,605	15,200	14,619
Food and kindred products.....	20	195,748	175,194	163,709	(3)	(3)	(3)	1,188	1,064	1,139
Tobacco manufactures.....	21	28,558	28,926	38,325	(3)	(3)	(3)	158	204	217
Textile mill products.....	22	22,448	21,495	22,321	1,800	1,426	1,341	335	310	300
Apparel.....	23	8,292	8,474	7,807	400	(3)	(3)	196	187	171
Lumber and wood products, except furniture.....	24	16,348	16,065	23,785	800	842	664	129	127	188
Furniture and fixtures.....	25	9,225	9,756	10,871	(3)	(3)	(3)	158	(3)	176
Paper and allied products.....	26	66,473	65,454	67,353	8,700	9,166	9,213	507	489	484
Printing, publishing, and allied industries.....	27	21,579	23,537	24,114	(3)	(3)	(3)	258	279	280
Chemicals and allied products.....	28	173,029	177,728	177,427	67,000	70,042	66,148	1,240	1,295	1,113
Petroleum refining.....	29	303,452	257,076	179,735	13,400	10,287	8,477	618	566	507
Rubber products.....	30	38,768	36,077	36,979	(3)	(3)	(3)	430	395	372
Leather and leather products.....	31	(3)	(3)	5,290	(3)	(3)	(3)	(3)	(3)	83
Stone, clay, and glass products.....	32	35,879	35,920	36,958	4,900	5,148	5,273	349	346	352
Primary metals.....	33	92,493	95,115	85,475	9,500	12,845	14,188	714	687	612
Fabricated metal products.....	34	45,362	43,027	43,241	(3)	(3)	(3)	471	434	417
Machinery.....	35	160,291	156,329	144,963	77,300	81,759	78,039	1,557	1,526	1,416
Electrical equipment.....	36	287,335	198,554	197,839	115,300	119,379	129,481	2,430	2,303	2,050
Transportation.....	37	276,578	303,551	312,775	135,500	143,478	146,287	2,150	2,233	2,185
Professional and scientific instruments.....	38	52,299	51,545	51,766	(3)	(3)	(3)	617	604	570
Miscellaneous manufacturing industries.....	39	12,084	11,118	10,121	(3)	(3)	(3)	147	125	108
Electric, gas, and sanitary services.....	49	69,299	63,625	58,266	1,000	825	789	254	221	230
Miscellaneous business services.....	73	10,135	6,585	7,931	18,900	18,103	18,028	147	120	122
Miscellaneous services.....	89	(3)	3,268	3,889	3,000	3,091	3,081	(3)	(3)	56
10-17, 41-48, 50-67										
Other nonmanufacturing industries.....	807	149,291	156,410	176,034	16,200	(3)	(3)	1,410	1,388	1,472

(1) Industries, industry groups, and product fields shown separately in statistical tables are classified according to Standard Industrial Classification (SIC) manual codes.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of more than 50 percent.

Source: National Science Foundation, SRS

Table B-3. Funds for research and development by industry and size of company: 1956, 1958, 1963, 1967, 1972, and 1974-86

		[Dollars in millions]															
Industry and size of company	SIC code	1956	1958	1963	1967	1972	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$6,605	\$8,389	\$12,630	\$16,385	\$19,552	\$26,997	\$29,825	\$33,304	\$38,226	\$44,505	\$51,810	\$57,996	\$63,403	\$71,460	\$78,268	\$80,629
Distribution by industry																	
Food, kindred, and tobacco products(2).....	20,21	64	83	130	183	259	355	415	472	528	620	(1)	(1)	(1)	(1)	(1)	(1)
Textiles and apparel.....	22,23	(1)	26	30	57	61	82	83	89	101	115	(1)	(1)	(1)	(1)	(1)	(1)
Lumber, wood products, and furniture.....	24,25	(1)	12	11	12	64	107	123	126	139	148	161	162	169	181	172	(1)
Paper and allied products.....	26	36	42	69	120	189	313	333	387	445	495	(1)	626	(1)	(1)	(1)	(1)
Chemicals and allied products.....	28	641	792	1,239	1,507	1,932	3,017	3,202	3,580	4,038	4,636	5,625	6,659	7,293	8,028	8,690	9,021
Industrial chemicals.....	281-82,286	460	553	809	966	1,031	1,524	1,668	1,798	1,962	2,197	2,802	3,301	3,411	3,512	3,900	4,059
Drugs and medicines.....	283	94	128	216	343	607	1,091	1,117	1,308	1,517	1,777	(1)	(1)	(1)	(1)	(1)	(1)
Other chemicals.....	284-85,287-89	87	111	214	198	294	401	417	474	559	662	(1)	(1)	(1)	(1)	(1)	(1)
Petroleum refining.....	29	182	246	317	371	468	767	918	1,060	1,262	1,552	(1)	(1)	(1)	(1)	(1)	(1)
Rubber products.....	30	(1)	89	156	182	377	502	491	493	577	656	(1)	(1)	(1)	(1)	(1)	1,075
Stone, clay, and glass products.....	32	60	75	100	136	183	263	287	324	356	406	(1)	(1)	(1)	(1)	(1)	(1)
Primary metals.....	33	90	131	183	242	277	506	538	560	634	728	878	1,000	1,115	(1)	(1)	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	80	106	135	146	256	284	314	375	443	(1)	(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products.....	333-36	(1)	51	77	107	130	250	254	246	259	285	(1)	(1)	(1)	351	428	454
Fabricated metal products.....	34	116	162	153	163	253	358	386	384	455	550	624	568	604	716	628	622
Machinery.....	35	543	781	950	1,326	2,158	3,487	3,880	4,283	4,825	5,901	6,818	7,835	8,386	9,667	10,853	10,696
Office, computing, and accounting machines.....	357	(3)	(3)	(3)	(3)	1,456	2,402	2,655	2,883	3,214	3,962	(1)	(1)	(1)	(1)	(1)	(1)
Other machinery, except electrical.....	351-56,358-59	(4)	(4)	(4)	(4)	(4)	(4)	1,225	1,400	1,611	1,939	(1)	(1)	(1)	(1)	(1)	(1)
Electrical equipment.....	36	1,516	1,969	2,868	3,867	4,680	5,636	5,886	6,507	7,824	9,175	10,329	11,642	13,950	15,694	17,055	18,030
Radio and TV receiving equipment.....	365	(5)	(5)	(5)	45	48	52	96	130	245	556	(1)	(1)	(1)	(1)	(1)	(1)
Communication equipment.....	366					2,583	2,511	2,725	2,999	3,635	4,024	4,758	5,750	7,112	8,319	8,816	8,964
Electronic components.....	367	(1)	868	1,773	2,425	330	691	770	902	1,169	1,547	1,573	1,661	1,964	2,441	2,778	3,121
Other electrical equipment.....	361-64,369	(1)	1,101	1,093	1,397	1,719	2,382	2,295	2,476	2,775	3,048	(1)	(1)	(1)	(1)	(1)	(1)
Transportation equipment.....	37																26,371
Motor vehicles and motor vehicles equipment.....	371					1,954	2,778	3,358	3,879	4,509	4,955	4,806	4,807	5,337	6,090	7,035	(1)
Other transportation equipment.....	373-75,379	688	856	1,090	1,354	56	94	120	131	159	162	(1)	(1)	(1)	(1)	(1)	(1)
Aircraft and missiles.....	372,376	2,138	2,609	4,712	5,669	4,950	6,339	7,033	7,536	8,041	9,198	11,968	13,658	13,853	16,033	17,918	16,240
Professional and scientific instruments.....	38	200	294	284	542	838	1,331	1,571	1,998	2,505	3,029	3,614	4,019	4,444	4,840	5,303	5,421
Scientific and mechanical measuring instruments.....	381-82	97	156	70	104	163	325	452	670	950	1,352	(1)	(1)	(1)	(1)	(1)	(1)
Optical, surgical, photographic, and other instruments.....	383-87	103	138	214	438	675	1,007	1,119	1,328	1,555	1,677	(1)	(1)	(1)	(1)	(1)	(1)
Other manufacturing industries.....	27,31,39	(1)	105	54	90	146	217	243	266	288	364	(1)	(1)	(1)	(1)	(1)	(1)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	(1)	117	276	559	707	845	958	1,229	1,540	1,815	1,906	2,005	2,189	2,585	2,914	2,716
Distribution by size of company (based on number of employees)																	
Less than 500.....		369	532	619	687	929	1,384	1,353	1,438	1,764	2,065	2,305	2,501	2,992	2,528	2,608	2,534
500 to 999.....															940	962	949
1,000 to 4,999.....		550	642	1,022	1,017	1,215	1,500	1,526	1,931	2,483	2,701	3,148	3,599	3,566	4,393	4,546	4,960
5,000 to 9,999.....					892	1,076	1,648	1,829	1,551	1,691	2,028	2,988	2,756	2,848	3,314	3,999	4,235
10,000 to 24,999.....		5,686	7,215	10,989		2,159	2,874	3,418	4,278	5,191	6,017	6,762	7,816	9,017	10,567	10,335	10,083
25,000 or more.....					13,790	14,173	19,591	21,699	24,106	27,097	31,693	36,607	41,322	44,980	49,718	55,819	57,868

- (1) Data have been withheld to avoid disclosing operations of individual companies.
 (2) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."
 (3) Data not tabulated at this level prior to 1972.
 (4) Data not tabulated at this level prior to 1977.
 (5) Included in the other electrical equipment group.

Table D-4. Funds for research and development by industry
and size of company: 1986

[Dollars in millions]

Industry	SIC code	Companies with total employment of--						
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total.....		\$80,629	\$2,534	\$949	\$4,960	\$4,235	\$10,083	\$57,868
Food, kindred, and tobacco products.....	20,21	(1)	5	(1)	(1)	162	(1)	656
Textiles and apparel.....	22,23	(1)	(1)	3	(1)	(1)	(2)	34
Lumber, wood products, and furniture.....	24,25	(1)	6	3	(1)	15	66	(1)
Paper and allied products.....	26	(1)	11	5	(1)	35	276	(1)
Chemicals and allied products.....	28	9,021	168	126	(1)	(1)	(1)	3,936
Industrial chemicals.....	281-82,286	4,059	54	33	(1)	360	(1)	2,900
Drugs and medicines.....	283	(1)	32	38	541	(1)	(1)	(1)
Other chemicals.....	284-85,287-89	(1)	82	55	285	(1)	(1)	(1)
Petroleum refining.....	29	(1)	5	(1)	(1)	(1)	(1)	(1)
Rubber products.....	30	1,075	90	17	(1)	(1)	(1)	(1)
Stone, clay, and glass products.....	32	(1)	13	14	18	54	(1)	(1)
Primary metals.....	33	(1)	53	20	165	(1)	(1)	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	22	(1)	(1)	(1)	(1)	(1)
Nonferrous metals and products.....	333-36	454	31	(1)	(1)	(1)	(1)	(1)
Fabricated metal products.....	34	622	(1)	27	(1)	189	(1)	(1)
Machinery.....	35	10,696	(1)	(1)	983	(1)	(1)	(1)
Office, computing, and accounting machines.....	357	(1)	(1)	(1)	(1)	306	215	(1)
Other machinery, except electrical.....	351-56,358-59	(1)	360	106	(1)	(1)	(1)	(1)
Electrical equipment.....	36	18,030	377	146	(1)	(1)	2,252	13,497
Radio and TV receiving equipment.....	365	(1)	(1)	(1)	42	(1)	(1)	0
Communication equipment.....	366	8,964	99	(1)	262	(1)	1,023	7,001
Electronic components.....	367	3,121	118	(1)	379	(1)	(1)	(1)
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)	(1)	419	(1)
Transportation equipment.....	37	26,371	193	(1)	180	(1)	1,231	24,455
Motor vehicles and motor vehicles equipment.....	371	(1)	1	12	41	(1)	(1)	(1)
Other transportation equipment.....	373-75,379	(1)	2	(1)	16	(1)	(1)	(1)
Aircraft and missiles.....	372,376	16,240	189	(1)	123	(1)	(1)	14,860
Professional and scientific instruments.....	38	5,421	285	(1)	449	(1)	(1)	(1)
Scientific and mechanical measuring instruments...	381-82	(1)	174	86	315	74	470	(1)
Optical, surgical, photographic, and other instruments.....	383-87	(1)	111	(1)	135	(1)	(1)	2,138
Other manufacturing industries.....	27,31,39	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	2,716	728	166	671	(1)	244	(1)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation, SRS

Table D-3. Funds for research and development by industry,
size of company, and size of R&D program: 1986

size of company, and size of R&D program: 1986		Size of R&D program [thousands of dollars]					
Industry and size of company	SIC code	Total	Less than	\$200 to	\$1,000 to	\$10,000 to	\$100,000 or
			\$200	\$999	\$9,999	\$99,999	more
[Millions of dollars]							
Total.....		980,629	9354	9918	93,441	910,233	965,682
Food, kindred, and tobacco products.....	20,21	(1)	5	21	132	577	(1)
Textiles and apparel.....	22,23	(1)	(1)	11	42	98	0
Lumber, wood products, and furniture.....	24,25	(1)	(1)	12	69	91	0
Paper and allied products.....	26	(1)	1	19	86	234	(1)
Chemicals and allied products.....	28	9,021	46	69	296	1,659	6,951
Industrial chemicals.....	281-82,286	4059	(1)	16	99	658	(1)
Drugs and medicines.....	283	(1)	(1)	22	28	443	3,291
Other chemicals.....	284-85,287-89	(1)	(1)	31	169	558	(1)
Petroleum refining.....	29	(1)	2	0	25	(1)	1,560
Rubber products.....	30	1,075	(1)	59	84	327	(1)
Stone, clay, and glass products.....	32	(1)	2	20	51	370	(1)
Primary metals.....	33	(1)	14	7	160	498	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	(1)	5	84	257	(1)
Nonferrous metals and products.....	333-36	454	(1)	3	76	241	(1)
Fabricated metal products.....	34	622	15	66	123	418	0
Machinery.....	35	10,696	72	277	541	1,548	8,258
Office, computing, and accounting machines.....	357	(1)	(1)	25	179	836	7,172
Other machinery, except electrical.....	351-36,358-59	(1)	(1)	252	361	712	1,086
Electrical equipment.....	36	18,030	46	85	571	1,439	15,889
Radio and TV receiving equipment.....	365	(1)	1	(2)	80	(1)	0
Communication equipment.....	366	8,964	16	25	89	496	8,337
Electronic components.....	367	3,121	21	10	172	(1)	(1)
Other electrical equipment.....	361-64,369	(1)	8	39	230	289	(1)
Transportation equipment.....	37	26,371	(2)	23	312	487	25,546
Motor vehicles and motor vehicles equipment.....	371	(1)	(2)	15	65	(1)	(1)
Other transportation equipment.....	373-75,379	(1)	(3)	3	21	(1)	(1)
Aircraft and missiles.....	372,376	16,240	(2)	4	226	330	15,679
Professional and scientific instruments.....	38	5,421	41	105	418	479	4,377
Scientific and mechanical measuring instruments....	381-82	(1)	8	(1)	251	320	1,917
Optical, surgical, photographic, and other instruments.....	383-87	(1)	32	(1)	168	160	2,460
Other manufacturing industries.....	27,31,39	(1)	(1)	34	87	273	0
	10-17,41-67,737,						
Nonmanufacturing industries.....	739,807,891	2,716	46	110	444	1,386	730
Distribution by size of company (based on number of employees)							
Less than 500.....		2,534	340	719	1,098	376	0
500 to 999.....		949	9	91	557	292	0
1,000 to 4,999.....		4,960	4	93	1,247	3,332	283
5,000 to 9,999.....		4,235	(3)	12	297	1,889	2,037
10,000 to 24,999.....		10,083	(2)	(2)	187	3,086	6,807
25,000 or more.....		57,868	0	1	54	1,257	56,555

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of more than 50 percent.

(3) Less than 0.5 million.

Table B-6. Number of companies with R&D expenditures by industry, size of company, and size of R&D program: 1986

Industry and size of company	SIC code	R&D size of program (thousands of dollars)					
		Total	Less than \$200	\$200 to \$999	\$1,000 to \$9,999	\$10,000 to \$99,999	\$100,000 or more
Total.....		10,995	7,632	1,889	1,027	336	111
Food, kindred, and tobacco products.....	20,21	268	152	53	38	23	2
Textiles and apparel.....	22,23	300	252	23	20	5	0
Lumber, wood products, and furniture.....	24,25	169	126	19	21	3	0
Paper and allied products.....	26	76	12	32	20	10	2
Chemicals and allied products.....	28	1,202	903	149	82	44	24
Industrial chemicals.....	281-82,286	325	242	34	27	14	8
Drugs and medicines.....	283	121	42	41	12	11	15
Other chemicals.....	284-85,287-89	756	619	74	43	19	1
Petroleum refining.....	29	76	57	0	8	5	6
Rubber products.....	30	706	590	85	19	10	2
Stone, clay, and glass products.....	32	142	68	46	18	9	1
Primary metals.....	33	535	463	13	37	20	2
Ferrous metals and products.....	331-32,3390-99	416	373	8	23	11	1
Nonferrous metals and products.....	333-36	119	90	5	14	9	1
Fabricated metal products.....	34	674	489	139	32	14	0
Machinery.....	35	2,333	1,609	457	189	63	15
Office, computing, and accounting machines.....	357	201	50	46	68	28	9
Other machinery, except electrical.....	351-56,358-59	2,132	1,559	411	121	35	6
Electrical equipment.....	36	1,651	1,191	205	190	42	23
Radio and TV receiving equipment.....	365	187	138	25	22	2	0
Communication equipment.....	366	326	222	55	26	12	11
Electronic components.....	367	718	620	19	57	15	7
Other electrical equipment.....	361-64,369	420	211	106	85	13	5
Transportation equipment.....	37	212	50	43	85	13	21
Motor vehicles and motor vehicles equipment.....	371	76	13	31	21	4	7
Other transportation equipment.....	373-75,379	43	26	7	8	1	1
Aircraft and missiles.....	372,376	93	11	5	56	8	13
Professional and scientific instruments.....	38	939	568	231	110	20	10
Scientific and mechanical measuring instruments....	381-82	358	115	160	66	12	5
Optical, surgical, photographic, and other instruments.....	383-87	581	453	71	44	8	5
Other manufacturing industries.....	27,31,39	435	330	65	29	11	0
Nonmanufacturing industries.....	10-17,41-67,737,739,807,891	1,277	772	329	129	44	3
Distribution by size of company (based on number of employees)							
Less than 500.....		9,411	7,464	1,519	414	14	0
500 to 999.....		472	111	174	176	11	0
1,000 to 4,999.....		666	47	170	318	129	2
5,000 to 9,999.....		164	4	19	65	63	11
10,000 to 24,999.....		172	6	5	42	85	34
25,000 or more.....		110	0	2	12	32	64

SOURCE: National Science Foundation, SRS

Table B-7. Company funds for research and development by industry and size of company: 1957-58, 1963, 1967, 1972, and 1974-86

(Dollars in millions)

Industry and size of company	SIC code	1957	1958	1963	1967	1972	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$3,396	\$3,630	\$5,360	\$8,020	\$11,535	\$17,436	\$19,340	\$22,115	\$25,708	\$30,476	\$35,428	\$39,512	\$42,861	\$48,298	\$51,439	\$52,847
Distribution by industry																	
Food, kindred, and tobacco products(2).....	20,21	74	77	(1)	101	250	(1)	(1)	(1)	(1)	(1)	636	762	766	1,001	995	1,083
Textiles and apparel.....	22,23	14	20	(1)	(1)	61	(1)	(1)	(1)	(1)	(1)	116	124	125	139	152	157
Lumber, wood products, and furniture.....	24,25	14	12	(1)	12	(1)	106	123	126	139	148	161	162	169	181	172	175
Paper and allied products.....	26	35	42	49	(1)	(1)	(1)	(1)	(1)	(1)	495	566	626	674	802	859	887
Chemicals and allied products.....	28	616	666	1,004	1,297	1,741	2,751	2,907	3,250	3,692	4,264	5,205	6,226	6,845	7,797	8,391	8,773
Industrial chemicals.....	281-82,286	423	443	662	785	860	1,275	1,387	1,473	1,617	1,856	2,393	2,879	2,970	3,289	3,618	3,812
Drugs and medicines.....	283	104	126	207	(1)	(1)	(1)	(1)	(1)	(1)	1,756	2,064	2,490	2,937	3,381	3,580	3,785
Other chemicals.....	284-85,287-89	89	97	135	(1)	(1)	(1)	(1)	(1)	(1)	653	747	856	938	1,126	1,193	1,176
Petroleum refining.....	29	200	234	296	355	454	715	842	939	1,109	1,401	1,780	1,981	2,030	2,173	2,101	1,867
Rubber products.....	30	70	60	111	160	255	(1)	(1)	(1)	(1)	590	665	743	804	801	776	
Stone, clay, and glass products.....	32	(1)	(1)	97	134	160	(1)	(1)	(1)	(1)	363	411	414	451	476	488	489
Primary metals.....	33	103	117	174	234	264	401	494	497	539	594	702	721	722	709	753	809
Ferrous metals and products.....	331-32,3348-99	63	78	105	134	144	252	261	271	305	338	415	436	419	389	366	388
Nonferrous metals and products.....	333-36	40	39	69	100	121	229	233	226	234	256	287	285	303	320	387	421
Fabricated metal products.....	34	97	105	129	151	243	322	342	348	414	501	545	510	542	654	585	544
Machinery.....	35	397	438	709	1,004	1,750	2,955	3,403	3,901	4,490	5,254	6,124	6,377	7,254	8,452	9,319	9,239
Office, computing, and accounting machines.....	357	(3)	(3)	(3)	(3)	(1)	1,893	2,220	2,356	2,958	3,436	3,847	4,722	5,182	6,171	7,109	6,876
Other machinery, except electrical.....	351-56,358-59	(4)	(4)	(4)	(4)	(4)	1,183	1,345	1,532	1,810	2,277	2,255	2,072	2,281	2,208	2,364	
Electrical equipment.....	36	608	632	1,017	1,571	2,313	3,001	3,238	3,741	4,515	5,431	6,409	7,048	8,664	9,738	10,023	10,468
Radio and TV receiving equipment.....	365	(5)	(5)	(5)	(1)	(1)	52	85	102	192	346	358	398	388	474	501	208
Communication equipment.....	366					1,165	1,418	1,559	1,763	2,049	2,367	2,975	3,568	4,540	5,205	5,222	5,155
Electronic components.....	367	230	253	564	930						1,165	1,212	1,269	1,618	1,989	2,258	2,537
Other electrical equipment.....	361-64,369	378	379	453	(1)	(1)	(1)	(1)	(1)	(1)	1,553	1,864	1,813	2,118	2,070	2,042	2,561
Transportation equipment.....	37														9,370	10,538	11,530
Motor vehicles and motor vehicles equipment.....	371					1,661	2,395	2,887	3,381	3,780	4,300	4,219	4,329	4,771	5,413	6,208	7,253
Other transportation equipment.....	373-75,379					29	(1)	(1)	(1)	(1)	88	80	96	160	152	138	137
Aircraft and missiles.....	372,376	299	333	452	1,138	978	1,418	1,547	1,823	2,201	2,570	3,440	3,882	3,448	3,804	4,192	4,141
Professional and scientific instruments.....	38	140	157	202	353	678	1,168	1,350	1,668	2,012	2,456	2,978	3,396	3,805	4,180	4,516	4,576
Scientific and mechanical measuring instruments.....	381-82	59	63	53	67	151	309	405	560	747	1,001	1,235	1,433	1,773	1,941	1,952	1,959
Optical, surgical, photographic, and other instruments.....	383-87	81	94	149	286	527	859	945	1,108	1,265	1,454	1,743	1,963	2,032	2,239	2,564	2,617
Other manufacturing industries.....	27,31,39	19	33	52	88	(1)	212	204	266	288	339	411	493	525	373	361	381
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	(1)	55	85	172	277	471	541	702	859	1,037	1,048	1,101	1,167	1,370	1,384	1,099
Distribution by size of company (based on number of employees)																	
Less than 500.....		375	299	425	459	603	1,085	1,145	1,226	1,375	1,711	1,880	1,997	2,394	2,021	2,072	1,951
500 to 999.....															776	731	698
1,000 to 4,999.....		406	440	596	666	843	1,231	1,289	1,586	1,893	2,257	2,586	3,023	2,946	3,713	3,861	4,217
5,000 to 9,999.....					642	890	1,334	1,439	1,310	1,463	1,596	2,369	2,271	2,094	2,909	3,379	3,469
10,000 to 24,999.....		2,615	2,891	4,338		1,540	2,325	2,583	3,203	4,012	4,867	5,537	6,410	7,148	8,396	8,175	8,248
25,000 or more.....					6,254	7,659	11,461	12,884	14,790	16,965	20,045	23,056	25,811	28,279	30,483	33,220	34,264

Note: Company funds include all funds for industrial R&D work performed within company facilities except funds provided by the Federal Government. Excluded are company-financed research and development contracted to outside organizations such as research institutions, universities and colleges, or other nonprofit organizations.

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

(3) Data not tabulated at this level prior to 1972.

(4) Data not tabulated at this level prior to 1977.

(5) Included in the other electrical equipment group.

SOURCE: National Science Foundation, SRS

Table B-8. Company funds for research and development by industry and size of company: 1986

[Dollars in millions]

Industry	SIC code	Companies with total employment of--						
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total.....		952,847	81,951	9698	94,217	93,469	98,248	934,264
Food, kindred, and tobacco products.....	20,21	1,083	5	(1)	(1)	162	147	656
Textiles and apparel.....	22,23	157	(2)	3	42	12	(2)	34
Lumber, wood products, and furniture.....	24,25	175	6	3	(1)	15	66	(1)
Paper and allied products.....	26	887	11	5	(1)	35	276	(1)
Chemicals and allied products.....	28	8,773	168	126	998	821	2,924	3,737
Industrial chemicals.....	281-82,286	3,812	54	33	171	(1)	(1)	2,701
Drugs and medicines.....	283	3,785	32	38	541	(1)	2,184	(1)
Other chemicals.....	284-85,287-89	1,176	82	55	285	122	(1)	(1)
Petroleum refining.....	29	1,867	5	(1)	(1)	(1)	159	1,683
Rubber products.....	30	776	(1)	17	115	79	244	(1)
Stone, clay, and glass products.....	32	489	13	14	18	54	168	223
Primary metals.....	33	809	24	(1)	165	(1)	209	288
Ferrous metals and products.....	331-32,3398-99	388	22	(1)	70	41	96	(1)
Nonferrous metals and products.....	333-36	421	1	(1)	95	(1)	113	(1)
Fabricated metal products.....	34	544	56	27	81	(1)	210	(1)
Machinery.....	35	9,239	489	185	961	566	866	6,172
Office, computing, and accounting machines.....	357	6,876	(1)	79	539	306	215	(1)
Other machinery, except electrical.....	351-56,358-59	2,364	(1)	106	422	259	652	(1)
Electrical equipment.....	36	10,460	349	93	725	781	1,753	6,758
Radio and TV receiving equipment.....	365	208	35	(1)	42	(1)	(1)	0
Communication equipment.....	366	5,155	87	(1)	138	(1)	547	3,891
Electronic components.....	367	2,537	118	20	351	(1)	682	(1)
Other electrical equipment.....	361-64,369	2,561	109	43	194	52	(1)	(1)
Transportation equipment.....	37	11,530	22	29	107	131	467	10,775
Motor vehicles and motor vehicles equipment.....	371	7,253	1	12	41	61	(1)	(1)
Other transportation equipment.....	373-75,379	137	2	(1)	16	(1)	(1)	(1)
Aircraft and missiles.....	372,376	4,141	18	(1)	49	(1)	212	3,787
Professional and scientific instruments.....	38	4,576	284	123	399	356	405	3,008
Scientific and mechanical measuring instruments....	381-82	1,959	174	86	275	74	(1)	(1)
Optical, surgical, photographic, and other instruments.....	383-87	2,617	110	37	124	283	(1)	(1)
Other manufacturing industries.....	27,31,39	381	35	13	137	(1)	109	(1)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	1,099	385	24	240	146	187	117

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation, CRS

Table B-9. Company-financed research and development contracted to outside organizations by industry and size of company: 1985

DATA NOT COLLECTED FOR 1986

[Dollars in millions]

Industry	SIC code	1985
Total.....		\$1,436
Food, kindred, and tobacco products.....	20,21	25
Textiles and apparel.....	22,23	(1)
Lumber, wood products, and furniture.....	24,25	4
Paper and allied products.....	26	30
Chemicals and allied products.....	28	387
Industrial chemicals.....	281-82,286	96
Drugs and medicines.....	283	231
Other chemicals.....	284-85,287-89	60
Petroleum refining	29	77
Rubber products.....	30	(2)
Stone, clay, and glass products.....	32	10
Primary metals.....	33	14
Ferrous metals and products.....	331-32,3398-99	(1)
Nonferrous metals and products.....	333-36	(1)
Fabricated metal products.....	34	(2)
Machinery.....	35	73
Office, computing, and accounting machines.....	357	32
Other machinery, except electrical.....	351-56,358-59	(2)
Electrical equipment.....	36	117
Radio and TV receiving equipment.....	365	(1)
Communication equipment.....	366	23
Electronic components.....	367	12
Other electrical equipment.....	361-64,369	(1)
Transportation equipment.....	37	(1)
Motor vehicles and motor vehicles equipment.....	371	(1)
Other transportation equipment.....	373-75,379	(1)
Aircraft and missiles.....	372,376	32
Professional and scientific instruments.....	38	(1)
Scientific and mechanical measuring instruments....	381-82	(1)
Optical, surgical, photographic, and other instruments.....	383-87	7
Other manufacturing industries.....	27,31,39	(2)
Nonmanufacturing industries.....	10-17,41-67,737,739,807,891	207

Distribution by size of company
(Based on number of employees)

Less than 500.....	(2)
500 to 999.....	(2)
1,000 TO 4,999.....	108
5,000 TO 9,999.....	(2)
10,000 TO 24,999.....	305
25,000 or more.....	820

- (1) Data have been withheld to avoid disclosing operations of individual companies.
(2) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-10. Number of companies contracting research and development to outside organizations by industry and size of company: 1985

Industry	SIC code	Companies with total employment of--											
		Less than 500		500 to 999		1,000 to 4,999		5,000 to 9,999		10,000 to 24,999		25,000 or more	
		Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside	Total	Outside
Total.....		11,025	845	494	69	696	130	187	38	178	64	115	45
Food, kindred, and tobacco products.....	20,21	172	39	48	10	43	10	23	8	16	6	10	2
Textiles and apparel.....	22,23	321	1	13	1	26	4	14	1	9	2	3	2
Lumber, wood products, and furniture.....	24,25	148	2	11	1	28	3	8	0	4	0	2	1
Paper and allied products.....	26	34	1	13	5	27	7	7	1	11	5	4	3
Chemicals and allied products.....	28	1,092	264	40	11	58	22	11	4	23	11	11	6
Industrial chemicals.....	281-82,286	305	54	9	3	12	4	7	3	4	2	7	4
Drugs and medicines.....	283	76	18	9	3	14	6	1	0	12	6	3	1
Other chemicals.....	284-85,287-89	711	192	22	5	32	12	3	1	7	3	1	1
Petroleum refining	29	37	1	1	0	5	2	2	0	4	3	8	6
Rubber products.....	30	796	2	30	5	24	2	5	1	4	1	2	0
Stone, clay, and glass products.....	32	226	44	19	0	11	2	8	2	7	3	3	1
Primary metals.....	33	473	2	16	4	42	7	14	0	12	4	4	4
Ferrous metals and products.....	331-32,3398-99	376	2	8	0	28	3	9	0	8	2	3	3
Nonferrous metals and products.....	333-36	97	0	8	4	14	4	5	0	4	2	1	1
Fabricated metal products.....	34	672	82	42	7	39	9	14	3	8	1	1	0
Machinery.....	35	2,259	117	83	7	116	16	20	3	17	6	11	5
Office, computing, and accounting machines.....	357	143	13	21	1	32	2	5	0	4	1	6	3
Other machinery, except electrical.....	351-56,358-59	2,116	104	62	6	84	14	15	3	13	5	5	2
Electrical equipment.....	36	1,229	92	60	4	92	14	20	2	16	6	17	4
Radio and TV receiving equipment.....	365	169	6	7	0	7	0	1	0	2	0	2	0
Communication equipment.....	366	303	20	12	1	20	0	3	0	6	2	7	1
Electronic components.....	367	448	41	18	0	24	3	6	1	3	2	4	1
Other electrical equipment.....	361-64,369	309	25	23	3	41	11	10	1	5	2	4	2
Transportation equipment.....	37	120	13	25	3	37	6	8	1	10	3	20	9
Motor vehicles and motor vehicles equipment.....	371	25	0	17	2	19	3	5	0	4	0	6	2
Other transportation equipment.....	373-75,379	29	0	5	1	7	1	1	1	1	0	2	0
Aircraft and missiles.....	372,376	66	13	3	0	11	2	2	0	5	3	12	7
Professional and scientific instruments.....	38	944	89	43	5	32	4	7	1	8	2	5	0
Scientific and mechanical measuring instruments.....	381-82	313	26	27	1	20	1	3	0	3	2	2	0
Optical, surgical, photographic, and other instruments.....	383-87	631	63	16	4	12	3	4	1	5	0	3	0
Other manufacturing industries.....	27,31,39	401	24	23	4	42	5	6	1	9	2	4	0
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	2,101	72	27	2	74	17	20	10	20	9	10	2

SOURCE: National Science Foundation, SRS

Table B-11. Company research and development performed outside the United States by U.S. domestic companies and their foreign subsidiaries, by selected industry: 1974-86

[Dollars in millions]

Industry	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$1,300	\$1,454	\$1,659	\$1,877	\$2,209	\$2,754	\$3,165	\$3,393	\$3,097	\$3,276	\$3,618	\$3,665	\$4,675
Food, kindred, and tobacco products(1)...	20,21	27	23	29	32	43	51	54	62	65	65	73	79	74
Chemicals and allied products.....	28	208	269	312	332	395	500	603	715	684	732	793	847	1,075
Industrial and other chemicals.....	281-82,284-89	82	85	108	133	151	199	245	287	313	354	363	410	523
Drugs and medicines.....	283	126	184	204	199	244	301	357	428	371	378	430	437	552
Petroleum refining.....	29	(3)	(3)	(3)	(3)	(3)	(3)	141	194	131	100	96	44	37
Stone, clay, and glass products.....	32	7	7	(3)	(3)	(3)	(4)	21	18	7	9	19	(2)	(2)
Primary metals.....	33	3	9	12	9	9	11	11	9	9	11	10	(2)	(2)
Fabricated metal products.....	34	(3)	(3)	22	24	29	(4)	(4)	30	25	23	21	22	27
Machinery.....	35	258	331	352	411	460	534	599	612	491	571	728	674	925
Electrical equipment.....	36	238	245	278	300	352	445	451	475	467	483	538	591	687
Radio and TV receiving equipment.....	365	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(2)	(2)	(2)
Communication equipment.....	366											(2)	(2)	(2)
Electronic components.....	367	4	7	9	13	17	25	29	40	36	(4)	77	92	111
Other electrical equipment.....	361-64,369	(4)	(4)	6	5	9	11	11	39	55	61	63	63	84
Transportation.....	37	406	412	464	558	640	874	1,020	884	840	874	898	1,012	1,298
Motor vehicles and other transportation equipment.....	371,373-75,379	364	373	423	514	(4)	(4)	(4)	(4)	(4)	(4)	(2)	(2)	(2)
Aircraft and missiles.....	372,376	42	39	41	44	(4)	(4)	(4)	(4)	(4)	(4)	(2)	(2)	(2)
Professional and scientific instruments..	38	39	49	69	81	121	156	186	230	237	(4)	264	170	213
Other manufacturing industries.....	22-27,30-31,39	111	105	137	144	181	213	139	156	132	105	161	164	236
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	3	4	4	9	12	5	7	8	9	16	17	48	89

Note: Data are reported in current U.S. dollars.

(1) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Included in the other manufacturing industries group.

(4) Not separately available but included in total. See general notes.

SOURCE: National Science Foundation, SRS

Table B-12. Company funds for R&D performance by selected industry: 1986 actual and 1987 projected

		[Dollars in millions]	
Industry	SIC code	Actual 1986	1987 (projected)
Total.....		\$52,847	(1)
Chemicals and allied products.....	28	8,773	9,368
Industrial chemicals.....	281-82,286	3,812	3,973
Machinery.....	35	9,239	12,371
Electrical equipment.....	36	10,460	(1)
Communication equipment.....	366	5,155	(1)
Motor vehicles and motor vehicles equipment.....	371	7,253	(1)
Aircraft and missiles.....	372,376	4,141	4,250
All other industries.....		12,981	16,687

(1) Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation, SRS

Table B-13. Federal funds for research and development by industry and size of company: 1957-58, 1963, 1967, 1972, and 1974-76

(Dollars in millions)

Industry and size of company	SIC code	1957	1958	1963	1967	1972	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		64,335	64,759	67,270	68,365	68,817	68,605	69,561	610,485	611,189	612,518	614,029	616,382	618,483	620,542	623,162	626,830	627,782
Distribution by industry																		
Food, kindred, and tobacco products(3).....	20,21	0	6	(2)	2	1	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Textiles and apparel.....	22,23	(2)	(2)	(2)	(2)	1	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Lumber, wood products, and furniture.....	24,25	(2)	(2)	(2)	0	(2)	0	0	0	0	0	(2)	0	0	0	0	0	(1)
Paper and allied products.....	26	0	0	0	(2)	2	(2)	(2)	(2)	(2)	(2)	(2)	(2)	0	(2)	(1)	(1)	(1)
Chemicals and allied products.....	28	89	126	234	210	189	234	266	295	330	346	372	421	434	448	232	299	248
Industrial chemicals.....	281-82,286	80	119	166	181	171	218	249	281	325	345	341	409	423	440	223	282	247
Drugs and medicines.....	283	0	2	9	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Other chemicals.....	284-85,287-89	9	14	79	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Petroleum refining.....	29	11	12	21	16	15	(2)	52	76	121	153	151	(2)	(2)	(2)	(1)	(1)	(1)
Rubber products.....	30	37	21	46	22	123	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	300
Stone, clay, and glass products.....	32	(2)	(2)	3	2	16	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Primary metals.....	33	5	14	10	8	12	21	26	44	63	95	135	176	279	392	(1)	(1)	(1)
Ferrous metals and products.....	331-32,3398-99	1	2	2	1	3	3	4	23	43	70	105	(2)	(2)	(2)	(1)	(1)	(1)
Nonferrous metals and products.....	333-34	4	12	8	6	10	17	22	21	20	25	30	(2)	(2)	(2)	32	41	34
Fabricated metal products.....	34	38	57	24	13	12	27	36	44	36	41	49	80	58	62	61	42	78
Machinery.....	35	272	343	250	322	401	509	532	477	382	335	647	694	857	1,131	1,216	1,536	1,456
Office, computing, and accounting machines.....	357	(4)	(4)	(4)	(4)	(2)	486	509	435	327	256	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Other machinery, except electrical.....	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	42	55	79	(2)	(2)	(2)	(2)	(1)	(1)	(1)
Electrical equipment.....	36	1,196	1,337	1,849	2,296	2,367	2,307	2,555	2,648	2,764	3,309	3,744	3,920	4,593	5,286	5,956	7,032	7,569
Radio and TV receiving equipment.....	365	(6)	(6)	(6)	(2)	(2)	(2)	0	11	28	53	210	(2)	(2)	(2)	(1)	(1)	(1)
Communication equipment.....	366					1,417	1,057	1,093	1,166	1,236	1,586	1,657	1,783	2,182	2,572	3,114	3,593	3,809
Electronic components.....	367	518	515	1,209	1,495							382	361	391	346	452	520	583
Other electrical equipment.....	361-64,369	678	722	640	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1,495	(2)	(2)	(2)	(1)	(1)	(1)
Transportation equipment.....	37															(1)	(1)	14,841
Motor vehicles and motor vehicles equipment.....	371					293	318	383	471	498	729	655	587	477	566	677	826	(1)
Other transportation equipment.....	373-75,379	190	296	291	360													
Aircraft and missiles.....	372,376	2,275	2,276	4,261	4,531	3,970	4,428	4,921	5,486	5,713	5,840	6,628	8,528	9,776	10,485	12,228	13,726	12,099
Professional and scientific instruments.....	38	109	137	81	109	161	172	163	221	330	493	573	637	623	639	660	787	844
Scientific and mechanical measuring instruments... Optical, surgical, photographic, and other instruments.....	381-82 383-87	80 29	93 44	16 65	37 152	13 148	15 157	15 148	47 174	110 220	203 290	350 223	(2) (2)	(2) (2)	(2) (2)	(1) (1)	(1) (1)	(1) (1)
Other manufacturing industries.....	27,31,39	74	72	3	(2)	(2)	7	5	39	0	0	25	(2)	(2)	(2)	(1)	(1)	(1)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	0	62	190	387	431	310	375	417	527	681	779	858	904	1,022	1,215	1,529	1,616
Distribution by size of company (based on number of employees)																		
Less than 500.....		167	233	194	228	326	273	299	208	212	389	354	424	504	599	507	535	583
500 to 999.....																164	231	251
1,000 to 4,999.....		226	282	425	351	372	253	270	237	345	590	444	562	576	620	680	684	742
5,000 to 9,999.....					251	186	280	313	390	241	228	432	619	485	754	405	620	766
10,000 to 24,999.....		3,942	4,324	6,651		619	371	548	835	1,075	1,179	1,150	1,225	1,406	1,848	2,172	2,160	1,835
25,000 or more.....					7,536	6,514	7,420	8,130	8,815	9,316	10,132	11,648	13,551	15,511	16,701	19,235	22,599	23,604

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Not separately available but included in total. See general notes.

(3) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

(4) Data not tabulated at this level prior to 1972.

(5) Data not tabulated at this level prior to 1977.

(6) Included in the other electrical equipment group.

SOURCE: National Science Foundation, SRS

Table D-14. Federal funds for research and development by
industry and size of company: 1986

(Dollars in millions)

Industry	SIC code	Companies with total employment of--						
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total.....		\$27,782	\$583	\$251	\$742	\$766	\$1,835	\$23,604
Food, kindred, and tobacco products.....	20,21	(1)	0	0	0	0	(1)	0
Textiles and apparel.....	22,23	(1)	(1)	0	0	(1)	0	0
Lumber, wood products, and furniture.....	24,25	(1)	0	0	0	0	0	(1)
Paper and allied products.....	26	(1)	0	0	0	0	0	(1)
Chemicals and allied products.....	28	248	0	0	(1)	(1)	(1)	199
Industrial chemicals.....	281-82,286	247	0	0	(1)	(1)	(1)	199
Drugs and medicines.....	283	(1)	0	0	0	0	(1)	0
Other chemicals.....	284-85,287-89	(1)	0	0	0	(1)	0	0
Petroleum refining.....	29	(1)	0	0	0	(1)	(1)	(1)
Rubber products.....	30	300	(1)	0	(1)	(1)	(1)	(1)
Stone, clay, and glass products.....	32	(1)	0	0	0	0	(1)	(1)
Primary metals.....	33	(1)	29	0	(3)	(1)	(1)	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	0	0	(3)	(1)	(1)	(1)
Nonferrous metals and products.....	333-36	34	29	0	(3)	0	(1)	(1)
Fabricated metal products.....	34	78	(1)	0	(1)	(1)	(1)	0
Machinery.....	35	1,456	(1)	(1)	22	(1)	(1)	(1)
Office, computing, and accounting machines.....	357	(1)	(2)	(1)	(1)	0	0	(1)
Other machinery, except electrical.....	351-56,358-59	(1)	(1)	(2)	(1)	(1)	(1)	(1)
Electrical equipment.....	36	7,569	28	53	(1)	(1)	499	6,739
Radio and TV receiving equipment.....	365	(1)	(1)	(1)	0	0	0	0
Communication equipment.....	366	3,809	12	(1)	124	(1)	477	3,111
Electronic components.....	367	583	0	(1)	29	0	(1)	(1)
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Transportation equipment.....	37	14,841	172	(1)	74	(1)	763	13,680
Motor vehicles and motor vehicles equipment.....	371	(1)	0	0	0	(1)	(1)	(1)
Other transportation equipment.....	373-75,379	(1)	0	0	0	(1)	0	(1)
Aircraft and missiles.....	372,376	12,099	172	(1)	74	(1)	(1)	11,073
Professional and scientific instruments.....	38	844	1	(1)	49	(1)	(1)	(1)
Scientific and mechanical measuring instruments...	381-82	(1)	(2)	0	39	0	(1)	(1)
Optical, surgical, photographic, and other instruments.....	383-87	(1)	1	(1)	10	(1)	0	(1)
Other manufacturing industries.....	27,31,39	(1)	(1)	(1)	(1)	0	(1)	0
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	1,616	343	142	431	(1)	58	(1)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of more than 50 percent.

(3) Less than 50.5 million.

SOURCE: National Science Foundation, SRS

Table B-15. Federal funds for research and development by selected industry and agency: 1963-77, 1979, 1981, 1983, and 1985

DATA NOT COLLECTED FOR 1986		[Dollars in millions]																	
Industry	SIC CODE	1963	1964	1965	1966	1967	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1981	1983	1985
Total.....		87,270	87,720	87,740	88,332	88,365	88,451	87,779	87,644	88,017	88,145	88,220	88,605	89,561	810,485	812,518	816,382	820,542	826,830
Chemicals and allied products.....	28	234	282	191	188	210	192	180	184	189	203	214	234	264	295	346	421	448	299
Machinery.....	35	250	266	239	286	322	260	262	315	401	429	511	509	532	477	335	694	1,131	1,536
Electrical equipment.....	36	1,049	1,873	1,983	2,201	2,296	2,390	2,211	2,258	2,367	2,410	2,307	2,307	2,555	2,648	3,309	3,920	5,286	7,032
Motor vehicles and other transportation equipment.....	371,373-75,379	291	322	325	344	360	290	314	309	319	424	335	365	(1)	(1)	(1)	(1)	(1)	(4)
Aircraft and missiles.....	372,376	4,261	4,621	4,499	4,724	4,531	4,524	4,005	3,864	3,970	3,889	4,003	4,434	4,930	5,486	5,040	8,520	10,405	13,726
Other industries.....	--	385	456	503	509	646	795	807	736	771	790	850	754	(1)	(1)	(1)	(1)	(1)	(4)
DOE (2)																			
Total.....		84,700	84,192	83,000	84,241	85,164	85,600	85,200	85,315	85,810	86,000	85,919	85,812	86,222	86,950	87,939	810,540	814,275	820,497
Chemicals and allied products.....	28	(1)	104	63	53	64	49	35	40	40	40	39	27	28	32	36	40	55	(5)
Machinery.....	35	148	132	147	227	220	182	186	201	250	302	426	405	442	395	541	599	987	1,322
Electrical equipment.....	36	1,200	1,720	1,130	1,292	1,437	1,304	1,404	1,503	1,643	1,770	1,643	1,570	1,607	1,692	1,920	2,338	3,573	5,007
Motor vehicles and other transportation equipment.....	371,373-75,379	(1)	194	221	229	261	242	272	266	232	325	251	280	337	382	(1)	(1)	(1)	(4)
Aircraft and missiles.....	372,376	2,700	2,309	2,006	2,239	2,745	3,050	2,771	2,848	3,004	3,077	2,992	3,120	3,400	3,900	4,210	6,121	8,115	11,265
Other industries.....	--	(1)	253	241	201	409	581	540	477	549	566	568	402	400	461	(1)	(1)	(1)	(4)
NASA (2)																			
Total.....		81,000	82,725	83,166	83,233	82,300	81,868	81,421	81,391	81,111	80,82	81,095	81,409	81,604	81,697	81,786	82,306	82,106	(5)
Chemicals and allied products.....	28	(1)	2	1	1	2	5	1	3	1	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(5)
Machinery.....	35	(1)	91	101	129	79	79	78	79	81	78	63	62	62	54	74	81	(1)	(4)
Electrical equipment.....	36	300	264	460	497	404	336	274	290	222	181	162	186	200	208	252	317	220	123
Motor vehicles and other transportation equipment.....	371,373-75,379	(1)	120	90	97	87	33	33	40	50	45	25	27	(1)	(1)	(1)	(1)	(1)	(5)
Aircraft and missiles.....	372,376	1,000	2,004	2,340	2,291	1,595	1,285	949	890	694	617	709	1,002	1,267	1,348	1,221	1,785	1,789	(5)
Other industries.....	--	(1)	165	163	220	133	132	87	65	95	60	(1)	(1)	45	64	119	70	(1)	(4)
DHE																			
Total.....		(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	81,575	81,976	81,909	82,839
Chemicals and allied products.....	28	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(1)	(1)	(1)	(5)
Machinery.....	35	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(1)	(1)	(1)	(5)
Electrical equipment.....	36	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	784	951	1,072	1,618
Motor vehicles and other transportation equipment.....	371,373-75,379	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	16	20	20	(5)
Aircraft and missiles.....	372,376	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	253	340	189	379
Other industries.....	--	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	287	356	275	560

(1) Not separately available but included in total. See general notes.

(2) For 1963-78, funds were based on approximately 175 companies leading in Federal R&D funds; 1975-85 funds are based on all companies reporting Federal R&D funds.

(3) Data not tabulated for this agency prior to 1979.

(4) Data have been withheld to avoid disclosing operations of individual companies.

(5) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table D-16. R&D-performing companies reporting Federal R&D funds
by industry and size of company: 1986

Industry	SIC code	Companies with total employment of--											
		Less than 500		500 to 999		1,000 to 4,999		5,000 to 9,999		10,000 to 24,999		25,000 or more	
		Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal	Total	Federal
Total.....		9,411	144	472	30	666	61	164	28	172	48	110	55
Food, kindred, and tobacco products...	20,21	137	0	38	0	47	0	18	0	14	1	14	0
Textiles and apparel.....	22,23	244	1	10	0	25	0	11	1	5	0	5	0
Lumber, wood products, and furniture...	24,25	119	0	11	0	24	0	7	0	6	0	2	1
Paper and allied products.....	26	21	0	9	0	24	0	6	0	12	0	4	1
Chemicals and allied products.....	28	1,073	0	34	0	53	1	12	2	20	7	10	5
Industrial chemicals.....	281-82,286	289	0	7	0	11	1	7	2	5	4	6	5
Drugs and medicines.....	283	89	0	7	0	11	0	2	0	9	3	3	0
Other chemicals.....	284-85,287-89	695	0	20	0	31	0	3	0	6	0	1	0
Petroleum refining.....	29	57	0	2	0	2	0	2	1	5	2	8	5
Rubber products.....	30	632	1	38	0	23	2	6	2	6	2	1	1
Stone, clay, and glass products.....	32	86	0	23	0	15	0	7	0	8	3	3	1
Primary metals.....	33	433	2	13	0	40	3	11	2	11	4	5	4
Ferrous metals and products.....	331-32,3398-99	370	0	4	0	25	1	7	2	6	1	4	3
Nonferrous metals and products.....	333-36	85	2	9	0	15	2	4	0	5	3	1	1
Fabricated metal products.....	34	565	1	46	0	43	3	11	4	8	2	1	0
Machinery.....	35	2,101	9	90	10	98	9	19	2	14	3	11	4
Office, computing, and accounting machines.....	357	145	8	17	2	25	1	4	0	3	0	7	3
Other machinery, except electrical...	351-56,358-59	1,956	1	73	8	73	8	15	2	11	3	4	1
Electrical equipment.....	36	1,472	16	52	8	83	15	11	2	21	8	12	11
Radio and TV receiving equipment.....	365	171	1	7	2	6	0	1	0	2	0	0	0
Communication equipment.....	366	296	6	5	3	11	6	2	1	6	4	6	6
Electronic components.....	367	667	0	13	2	28	6	2	0	5	3	3	3
Other electrical equipment.....	361-64,369	338	9	27	1	38	3	6	1	8	1	3	2
Transportation equipment.....	37	103	44	27	2	47	5	8	5	9	6	18	16
Motor vehicles and motor vehicles equipment.....	371	13	0	18	0	30	0	5	3	4	2	6	4
Other transportation equipment.....	373-75,379	29	0	3	0	8	0	1	1	1	0	1	1
Aircraft and missiles.....	372,376	61	44	6	2	9	5	2	1	4	4	11	11
Professional and scientific instruments	38	847	3	36	2	39	10	8	1	4	2	5	4
Scientific and mechanical measuring instruments.....	381-82	307	2	22	0	21	6	3	0	3	2	2	2
Optical, surgical, photographic, and other instruments.....	383-87	540	1	14	2	18	4	5	1	1	0	3	2
Other manufacturing industries.....	27,31,39	365	3	16	1	37	1	5	0	9	1	3	0
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	1,134	64	27	7	66	12	22	6	20	7	8	2

SOURCE: National Science Foundation, SRS

Table D-17. Industry-administered federally-funded research and development centers—composition of workforce and funds by character of work: 1984-86

[Dollars in millions]			
Item	1984	1985	1986
Total R&D funds(1).....	\$1,739	\$1,863	\$1,924
Basic research.....	136	131	124
Applied research.....	547	630	643
Development.....	1,056	1,102	1,157
January			
	1985	1986	1987
Full-time-equivalent number of R&D scientists and engineers	9,964	9,833	9,793
March			
	1984	1985	1986
Total employment.....	28,552	28,570	27,222

(1) All of these funds were devoted to Federal R&D activities.

SOURCE: National Science Foundation, SRS

Table D-18. R&D-performing companies in manufacturing and nonmanufacturing industries by size of company: 1986

Size of company (based on number of employees)	Number of companies reporting R&D funds		
	Total	Manu- facturing	Nonmanu- facturing
Total.....	10,995	9,696	1,299
Less than 500.....	9,411	8,255	1,156
500 to 999.....	472	445	27
1,000 to 4,999.....	666	600	66
5,000 to 9,999.....	164	142	22
10,000 to 24,999.....	172	152	20
25,000 or more.....	110	102	8

SOURCE: National Science Foundation, SRS

Table B-19. Percent of total, Federal, company funds, and net sales of R&D-performing companies ranked by size of R&D program: 1972, and 1974-86

Companies ranked by size of R&D program (1)	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Percent of total R&D funds ranked by size of total R&D funds														
First 4 (1-4).....	18	20	20	20	20	19	20	17	18	20	19	17	18	22
Next 4 (5-8).....	16	15	15	14	14	14	13	14	12	12	11	13	12	12
Next 12 (9-20).....	21	21	19	20	19	19	19	18	20	19	17	17	17	17
Next 20 (21-40).....	12	11	12	12	13	13	13	13	12	13	13	13	13	13
Next 60 (41-100).....	13	15	15	15	15	15	15	15	18	16	17	18	16	16
Next 100 (101-200).....	7	8	8	8	9	9	9	9	9	9	9	9	9	9
Next 200 (201-400).....	6	6	6	6	6	6	6	6	6	6	6	6	5	6

Percent of Federal R&D funds ranked by size of Federal funds														
First 4 (1-4).....												30	29	30
Next 4 (5-8).....												15	15	16
Next 12 (9-20).....												26	27	28
Next 20 (21-40).....												17	16	17
Next 60 (41-100).....												10	7	8
Next 100 (101-200).....												1	2	1
Next 200 (201-400).....												0	0	0

Percent of company R&D funds ranked by company R&D funds														
First 4 (1-4).....												22	23	23
Next 4 (5-8).....												8	7	8
Next 12 (9-20).....												12	12	13
Next 20 (21-40).....												12	12	13
Next 60 (41-100).....												18	18	18
Next 100 (101-200).....												11	10	10
Next 200 (201-400).....												7	7	7

Percent of net sales ranked by size of total R&D funds														
First 4 (1-4).....												7	8	9
Next 4 (5-8).....												4	4	5
Next 12 (9-20).....												5	5	5
Next 20 (21-40).....												8	8	8
Next 60 (41-100).....												12	12	12
Next 100 (101-200).....												13	13	11
Next 200 (201-400).....												14	15	16

(1) Companies were ranked individually for each year; therefore, particular companies comprising the size groups may have changed from year to year.

SOURCE: National Science Foundation, SRS

Table B-20. Net sales of R&D-performing companies by industry and size of company: 1985-86

(Dollars in millions)

Industry	SIC code	1985								1986							
		Companies with total employment of--								Companies with total employment of--							
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more	Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more	Total	Less than 500
Total.....		91,949,752	(2)	(2)	9205,467	9210,640	8397,012	91,021,089	91,886,975	973,100	938,548	9212,687	9185,387	9375,097	91,002,077		
Food, kindred, and tobacco products.....	20,21	204,121	(2)	(2)	(2)	34,091	60,005	71,187	202,034	5,428	4,819	26,533	25,845	32,969	106,441		
Textiles and apparel.....	22,23	29,970	2,260	(2)	(2)	5,921	8,548	6,250	30,127	2,224	1,265	6,336	5,343	5,438	9,521		
Lumber, wood products, and furniture.....	24,25	25,021	1,190	(2)	6,575	5,229	(2)	7,029	34,657	1,388	815	7,701	3,630	6,610	14,513		
Paper and allied products.....	26	65,454	(2)	(2)	(2)	5,605	26,419	22,008	67,353	1,277	814	8,316	5,150	31,037	20,759		
Chemicals and allied products.....	28	177,720	(2)	4,167	19,990	26,399	45,137	73,714	177,427	8,078	4,164	20,409	24,815	47,282	72,678		
Industrial chemicals.....	281-82,286	89,165	(2)	925	4,115	19,658	9,343	52,767	89,030	2,323	905	4,120	18,956	12,091	50,634		
Drugs and medicines.....	283	43,103	(1)	841	5,187	3,253	22,079	(1)	42,793	(1)	813	5,514	2,195	22,515	(1)		
Other chemicals.....	284-85,287-89	45,460	(1)	2,401	10,688	3,488	13,714	(1)	45,604	(1)	2,446	10,776	3,663	12,676	(1)		
Petroleum refining.....	29	257,076	(1)	(2)	6,812	(1)	40,275	199,051	179,735	595	1,042	(1)	(1)	34,444	137,951		
Rubber products.....	30	36,077	(2)	(2)	5,110	3,773	(1)	(1)	36,979	(1)	2,172	6,377	3,947	14,195	(1)		
Stone, clay, and glass products.....	32	35,920	(2)	(2)	(2)	6,043	11,408	9,389	36,950	2,139	1,953	4,224	5,236	13,263	10,143		
Primary metals.....	33	95,115	(2)	(2)	8,566	14,529	26,914	40,926	85,475	2,690	1,474	(1)	(1)	24,472	(1)		
Ferrous metals and products.....	331-32,3390-99	67,208	(2)	(1)	(2)	7,791	15,467	(1)	58,113	1,558	654	6,274	7,513	12,792	29,322		
Nonferrous metals and products.....	333-36	27,908	1,305	(1)	2,953	6,738	11,447	(1)	27,362	1,133	820	(1)	(1)	11,680	(1)		
Fabricated metal products.....	34	43,027	(2)	(1)	(2)	9,413	13,262	(1)	43,241	(1)	2,769	10,350	9,014	12,553	(1)		
Machinery.....	35	156,329	(2)	4,998	26,027	25,543	25,244	59,678	144,963	14,522	5,922	23,788	22,357	22,899	55,275		
Office, computing, and accounting machines.....	357	59,853	(2)	1,109	5,284	2,403	6,159	43,349	57,072	1,516	1,138	5,493	2,201	5,113	41,612		
Other machinery, except electrical.....	351-56,358-59	96,476	(2)	3,889	20,743	23,140	19,085	16,329	87,891	13,006	4,785	18,295	20,356	17,786	13,663		
Electrical equipment.....	36	198,554	(2)	(2)	16,090	12,484	27,115	131,330	197,839	8,495	3,445	16,258	9,663	36,638	123,341		
Radio and TV receiving equipment.....	365	18,209	(2)	525	(2)	(1)	5,719	(1)	10,555	(1)	472	1,007	(1)	5,970	0		
Communication equipment.....	366	80,373	(2)	730	2,855	1,988	8,366	64,877	78,696	(1)	376	2,473	(1)	8,092	64,490		
Electronic components.....	367	29,954	(2)	(2)	3,343	2,346	4,860	16,089	29,738	2,257	627	4,558	(1)	6,962	(1)		
Other electrical equipment.....	361-64,369	70,017	(2)	(2)	8,745	(1)	8,170	(1)	78,851	3,753	1,970	8,219	(1)	15,614	(1)		
Transportation equipment.....	37	303,551	(2)	(2)	(2)	(2)	20,306	261,815	312,775	1,886	1,804	11,008	6,869	16,981	274,228		
Motor vehicles and motor vehicles equipment.....	371	186,385	(2)	(2)	(2)	(2)	9,523	164,802	198,948	(2)	1,216	6,075	4,705	9,251	177,175		
Other transportation equipment.....	373-75,379	10,981	591	(2)	(2)	(1)	(1)	(1)	10,264	723	209	2,979	(1)	(1)	(1)		
Aircraft and missiles.....	372,376	106,185	(2)	(2)	1,970	(1)	(1)	(1)	103,563	638	378	1,953	(1)	(1)	(1)		
Professional and scientific instruments.....	38	51,545	(2)	2,454	5,781	3,281	7,802	27,880	51,766	4,604	1,965	6,351	5,033	5,469	28,345		
Scientific and mechanical measuring instruments..	381-82	21,978	(1)	1,441	2,996	1,337	4,873	(1)	21,699	2,041	1,145	3,241	1,306	(1)	(1)		
Optical, surgical, photographic, and other instruments.....	383-87	29,567	(1)	1,013	2,785	1,944	2,929	(1)	30,067	2,563	820	3,110	3,727	(1)	(1)		
Other manufacturing industries.....	27,31,39	39,576	(2)	(2)	10,377	3,982	11,205	(2)	39,525	2,843	1,448	9,172	4,474	13,290	(2)		
Nonmanufacturing industries.....	10-17,41-47,737, 739,807,891	229,888	7,263	(2)	(2)	36,861	56,055	88,701	246,120	8,990	2,675	43,159	37,469	57,555	96,272		

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-21. R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and size of company: 1957-58, 1963, 1967, 1972, and 1974-86

		[Percent]																	
Industry and size of company	SIC code	1957	1958	1963	1967	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		3.4	3.8	4.5	4.2	3.4	3.1	3.1	3.1	2.9	2.9	2.6	3.0	3.1	3.8	3.9	3.9	4.4	4.7
Distribution by industry																			
Food, kindred, and tobacco products(2).....	20,21	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	(1)	(1)	(1)	(3)	(3)	(3)
Textiles and apparel.....	22,23	(1)	0.3	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	(1)	(1)	(1)	(3)	(3)	(3)
Lumber, wood products, and furniture.....	24,25	(1)	0.4	0.5	0.3	0.8	0.8	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.9	0.8	0.7	0.7	(3)
Paper and allied products.....	26	0.6	0.7	0.8	0.9	0.8	0.8	0.9	1.0	0.9	0.9	1.0	1.0	(1)	1.2	(1)	(3)	(3)	(3)
Chemicals and allied products.....	28	3.5	3.8	4.3	4.6	3.6	3.5	3.7	3.7	3.6	3.6	3.5	3.6	3.6	4.3	4.4	4.6	4.9	5.1
Industrial chemicals.....	281-82,286	5.0	5.4	5.1	4.8	3.9	3.3	3.6	3.7	3.5	3.5	3.2	3.3	3.2	4.0	3.9	4.0	4.4	4.6
Drugs and medicines.....	283	3.6	4.1	4.7	6.1	6.5	6.3	6.4	6.3	6.4	6.2	6.1	6.2	(1)	(1)	(1)	(3)	8.3	(3)
Other chemicals.....	284-85,287-89	1.3	1.5	2.0	2.3	1.7	1.6	1.7	1.7	1.8	1.8	1.8	1.9	(1)	(1)	(1)	(3)	2.7	(3)
Petroleum refining.....	29	0.7	1.1	1.0	0.8	0.8	0.6	0.7	0.6	0.7	0.7	0.7	0.6	(1)	(1)	(1)	(3)	(3)	(3)
Rubber products.....	30	1.7	1.8	2.3	1.9	2.6	2.5	2.5	2.4	2.1	1.9	1.9	2.2	(1)	(1)	(1)	(3)	(3)	2.9
Stone, clay, and glass products.....	32	(2)	(2)	1.6	1.8	1.7	1.7	1.2	1.2	1.3	1.3	1.3	1.4	(1)	(1)	(1)	(3)	(3)	(3)
Primary metals.....	33	0.5	0.7	0.8	0.8	0.7	0.6	0.8	0.8	0.7	0.7	0.6	0.7	0.9	1.1	1.3	(3)	(3)	(3)
Ferrous metals and products.....	331-32,3390-99	(1)	0.6	0.7	0.8	0.6	0.5	0.6	0.6	0.6	0.6	0.6	0.7	(1)	(1)	(1)	(3)	(3)	(3)
Nonferrous metals and products.....	333-36	(1)	0.7	1.1	1.0	0.9	1.0	1.2	1.2	1.0	0.8	0.7	0.7	(1)	(1)	(1)	1.3	1.5	1.7
Fabricated metal products.....	34	1.6	1.7	1.6	1.3	1.1	1.2	1.2	1.2	1.2	1.1	1.1	1.4	1.4	1.3	1.5	1.6	1.5	1.4
Machinery.....	35	3.4	3.8	4.2	4.2	4.3	4.6	4.8	4.9	4.9	4.6	4.5	5.0	4.9	5.5	5.9	6.0	6.9	7.4
Office, computing, and accounting machines.....	357	(4)	(4)	(4)	(4)	11.1	12.6	12.0	11.6	11.5	11.1	11.0	12.0	(1)	(1)	(1)	(3)	(3)	(3)
Other machinery, except electrical.....	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	2.2	2.1	2.1	2.3	(1)	(1)	(1)	(3)	(3)	(3)
Electrical equipment.....	36	7.6	10.3	10.1	8.6	7.1	6.6	6.5	6.7	6.9	5.8	6.0	6.6	6.8	7.7	8.6	7.6	8.6	9.1
Radio and TV receiving equipment.....	365	(6)	(6)	(6)	1.9	1.6	1.7	1.4	1.4	1.8	1.8	2.5	4.3	(1)	(1)	(1)	(3)	(3)	(3)
Communication equipment.....	366					8.7	7.6	7.6	7.6	7.7	7.7	8.8	9.1	9.6	11.5	12.5	10.1	11.0	11.4
Electronic components.....	367	(1)	11.3	13.0	10.3														
Other electrical equipment.....	361-64,369	(1)	9.7	7.3	7.3	6.3	6.3	6.0	6.3	5.2	5.1	4.9	4.9	(1)	(1)	(1)	(3)	(3)	(3)
Transportation equipment.....	37																(3)	(3)	8.4
Motor vehicles and motor vehicles equipment.....	371					3.3	3.7	3.5	3.2	3.1	3.3	3.8	4.9	4.5	4.6	4.1	3.6	3.8	(3)
Other transportation equipment.....	373-75,379	2.9	4.2	3.4	3.4														
Aircraft and missiles.....	372,376	16.8	17.7	26.7	19.7	16.6	14.1	12.7	12.7	13.3	13.3	12.9	13.7	16.0	17.7	16.2	16.9	16.9	15.7
Professional and scientific instruments.....	38	7.0	7.8	5.9	5.4	5.9	6.1	5.9	6.2	6.3	6.9	7.3	7.5	8.1	8.9	9.4	9.3	10.3	10.5
Scientific and mechanical measuring instruments... Optical, surgical, photographic, and other instruments.....	381-82 383-87	9.5 5.2	10.2 6.3	4.1 6.9	3.9 6.0	4.1 6.6	4.5 6.7	4.9 6.3	5.4 6.4	6.3 6.4	7.1 6.8	7.3 7.2	8.4 6.9	(1) (1)	(1) (1)	(1) (1)	(3) (3)	(3) (3)	(3) (3)
Other manufacturing industries.....	27,31,39	(1)	1.3	0.7	0.6	0.8	0.9	0.8	0.7	0.6	0.5	0.4	0.4	(1)	(1)	(1)	(3)	(3)	(3)
Distribution by size of company (based on number of employees)																			
Less than 500.....		1.8	1.3	1.9	1.7	1.7	1.8	1.6	1.7	1.5	1.6	1.6	1.4	1.5	2.1	1.7	1.5	2.1	2.8
500 to 999.....																	2.0	2.0	2.2
1,000 to 4,999.....		1.8	1.8	2.4	1.7	1.7	1.5	1.4	1.4	1.6	1.6	1.8	1.8	1.7	1.9	1.9	2.1	2.4	2.5
5,000 to 9,999.....					2.1	1.9	1.8	1.8	1.9	2.0	1.4	1.3	1.4	2.1	1.7	1.8	1.9	2.0	2.5
10,000 to 24,999.....		3.9	4.8	5.3		1.9	1.6	1.7	1.8	1.9	1.9	1.7	1.7	1.9	2.4	2.8	3.0	3.0	3.1
25,000 or more.....					5.2	4.7	4.2	4.5	4.2	4.2	4.0	3.8	4.0	4.6	5.4	5.4	5.2	5.9	6.3

(1) Not separately available but included in total. See general notes.

(2) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

(3) Data have been withheld to avoid disclosing operations of individual companies.

(4) Data not tabulated at this level prior to 1972.

(5) Data not tabulated at this level prior to 1977.

(6) Included in the other electrical equipment group.

Table B-22. Company R&D funds as a percent of net sales in R&D-performing manufacturing companies by industry and size of company: 1957-58, 1963, 1967, 1972, and 1974-86

		[Percent]																	
Industry and size of company	SIC code	1957	1958	1963	1967	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		1.5	1.6	1.9	2.1	2.0	2.0	2.0	2.0	2.0	2.0	1.9	2.1	2.2	2.6	2.6	2.6	2.9	3.2
Distribution by industry																			
Food, kindred, and tobacco products(2).....	20,21	0.3	0.3	(1)	0.5	0.4	0.4	(1)	(1)	(1)	(1)	(1)	(1)	0.4	0.4	0.4	0.4	0.5	0.5
Textiles and apparel.....	22,23	(1)	0.2	0.4	(1)	0.4	(1)	(1)	(1)	(1)	(1)	(1)	(1)	0.4	0.5	0.4	0.5	0.5	0.5
Lumber, wood products, and furniture.....	24,25	(1)	0.4	(1)	0.3	(1)	(1)	0.7	0.7	0.8	0.7	0.7	0.8	0.8	0.9	0.8	0.7	0.7	0.5
Paper and allied products.....	26	0.6	0.7	0.8	(1)	0.8	(1)	(1)	(1)	(1)	(1)	(1)	1.0	1.0	1.2	1.1	1.2	1.3	1.3
Chemicals and allied products.....	28	3.1	3.2	3.6	4.0	3.3	3.0	3.1	3.3	3.3	3.2	3.2	3.3	3.4	4.0	4.1	4.5	4.7	4.9
Industrial chemicals.....	281-82,286	4.2	4.3	4.1	3.9	3.2	2.8	3.1	3.1	3.0	2.9	2.6	2.8	2.8	3.5	3.4	3.7	4.1	4.3
Drugs and medicines.....	283	3.6	4.0	4.5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	6.1	6.3	7.1	7.8	8.4	8.3	8.8
Other chemicals.....	284-85,287-89	1.2	1.3	1.8	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	1.9	2.1	2.2	2.3	2.5	2.6	2.6
Petroleum refining.....	29	0.7	1.1	1.2	0.8	0.7	0.5	(1)	0.6	0.6	0.7	0.6	0.5	0.6	0.8	0.7	0.7	0.8	1.0
Rubber products.....	30	1.1	1.4	1.6	1.7	1.7	(1)	(1)	(1)	(1)	(1)	(1)	1.9	2.2	2.2	2.3	2.2	2.1	
Stone, clay, and glass products.....	32	(2)	(2)	1.6	1.7	1.6	1.5	(1)	(1)	(1)	(1)	(1)	1.3	1.4	1.5	1.5	1.3	1.4	1.3
Primary metals.....	33	0.5	0.6	0.7	0.8	0.7	0.5	0.7	0.8	0.7	0.6	0.5	0.5	0.7	0.8	0.8	0.8	0.8	0.9
Ferrous metals and products.....	331-32,3390-99	(1)	0.6	0.7	0.7	0.6	(1)	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.7	0.7	0.6	0.5	0.7
Nonferrous metals and products.....	333-36	(1)	0.6	0.9	0.9	0.9	(1)	1.1	1.1	0.9	0.8	0.6	0.6	1.0	1.2	1.1	1.1	1.4	1.5
Fabricated metal products.....	34	1.1	1.1	1.4	1.2	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.2	1.2	1.2	1.3	1.4	1.4	1.3
Machinery.....	35	2.0	2.1	3.1	3.2	3.5	3.8	4.0	4.2	4.3	4.2	4.2	4.5	4.4	4.9	5.1	5.3	6.0	6.4
Office, computing, and accounting machines.....	357	(3)	(3)	(3)	(3)	(1)	(1)	9.4	9.1	9.6	9.8	10.1	10.4	9.7	10.3	10.0	10.5	11.9	12.0
Other machinery, except electrical.....	351-56,358-59	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	2.1	2.0	2.0	2.2	2.3	2.3	2.3	2.2	2.3	2.7
Electrical equipment.....	36	2.6	3.3	3.6	3.5	3.5	3.5	3.6	3.7	3.4	3.4	3.6	3.9	4.2	4.7	5.3	4.7	5.0	5.3
Radio and TV receiving equipment.....	365	(5)	(5)	(5)	(1)	(1)	1.4	1.4	1.4	1.4	1.4	1.7	2.7	2.6	2.9	2.3	2.6	2.7	2.0
Communication equipment.....	366					3.9	3.9	4.2	4.3	4.4	4.5	5.0	5.4	6.0	7.1	8.0	5.9	6.5	6.6
		(1)	3.3	4.2	3.9														
Electronic components.....	367					3.7	3.9	(1)	(1)	(1)	(1)	(1)	5.9	5.7	5.1	6.3	6.2	7.5	8.5
Other electrical equipment.....	361-64,369	(1)	3.3	3.0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	2.5	2.8	2.9	3.3	3.0	2.9	3.2
Transportation equipment.....	37																3.4	3.5	3.7
Motor vehicles and motor vehicles equipment.....	371	2.1	2.8	2.5	2.5	2.8	3.2	3.0	2.7	2.7	2.9	3.2	4.2	3.9	4.1	3.6	3.2	3.3	3.6
Other transportation equipment.....	373-75,379					0.6	0.6	0.6	0.6	0.7	(1)	(1)	0.3	0.3	0.6	1.3	1.3	1.3	1.3
Aircraft and missiles.....	372,376	2.0	2.3	2.4	4.0	3.3	3.5	2.8	2.8	2.9	3.2	3.5	3.8	4.6	5.0	4.0	4.0	3.9	4.0
Professional and scientific instruments.....	38	3.9	4.1	4.2	3.5	4.8	5.2	5.1	5.4	5.4	5.7	5.8	6.1	6.7	7.5	8.0	8.0	8.8	8.8
Scientific and mechanical measuring instruments...	381-82	4.0	4.0	3.1	2.5	3.8	4.4	4.7	5.3	5.7	5.9	5.8	6.2	6.9	7.7	9.0	8.4	8.9	9.0
Optical, surgical, photographic, and other instruments.....	383-87	3.0	4.1	4.8	3.9	5.1	5.5	5.2	5.5	5.4	5.6	5.9	6.0	6.6	7.3	7.3	7.6	8.7	8.7
Other manufacturing industries.....	27,31,39	(1)	(1)	0.6	(1)	(1)	(1)	0.7	0.7	0.6	0.5	0.4	0.4	0.4	0.8	0.9	1.0	0.9	1.0
Distribution by size of company (based on number of employees)																			
Less than 500.....		1.4	0.7	1.5	1.6	1.5	1.6	1.4	1.5	1.5	1.4	1.5	1.2	1.4	1.8	1.4	1.3	2.1	2.4
500 to 999.....																	1.9	1.8	1.9
1,000 to 4,999.....		1.2	1.3	1.5	1.4	1.3	1.2	1.2	1.2	1.4	1.4	1.4	1.4	1.5	1.7	1.9	1.9	2.2	2.3
5,000 to 9,999.....					1.6	1.5	1.4	1.5	1.6	1.5	1.2	1.1	1.1	1.7	1.5	1.4	1.7	1.9	2.2
10,000 to 24,999.....		1.6	1.9	2.1		1.4	1.3	1.5	1.4	1.4	1.4	1.4	1.4	1.6	2.0	2.3	2.4	2.4	2.5
					2.3														
25,000 or more.....						2.5	2.4	2.6	2.5	2.4	2.5	2.4	2.5	2.7	3.3	3.4	3.2	3.5	3.8

(1) Not separately available but included in total. See general notes.

(2) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

(3) Data not tabulated at this level prior to 1972.

(4) Data not tabulated at this level prior to 1977.

(5) Included in the other electrical equipment group.

Table B-23. Total R&D funds as a percent of net sales in R&D-performing manufacturing companies ranked by size of R&D program by industry: 1986

Industry	SIC code	Percent total R&D funds of net sales			Total R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		10.4	9.9	13.5	\$17,486	\$9,934	\$13,802
Food, kindred, and tobacco products.....	20,21	1.1	0.9	0.8	448	154	261
Textiles and apparel.....	22,23	1.6	0.7	0.3	86	25	26
Lumber, wood products, and furniture.....	24,25	(1)	1.1	0.5	(1)	24	30
Paper and allied products.....	26	(1)	1.3	0.5	(1)	96	112
Chemicals and allied products.....	28	6.8	7.6	6.5	2,657	1,380	2,399
Industrial chemicals.....	281-82,286	6.8	4.6	3.3	2,657	616	636
Drugs and medicines.....	283	12.8	6.8	8.8	1,261	911	1,431
Other chemicals.....	284-85,287-89	3.5	(2)	2.2	609	(2)	203
Petroleum refining.....	29	1.6	0.9	0.6	1,233	515	185
Rubber products.....	30	5.0	4.2	2.4	680	158	158
Stone, clay, and glass products.....	32	3.6	1.4	0.8	345	109	73
Primary metals.....	33	3.4	(2)	1.2	920	(2)	240
Ferrous metals and products.....	331-32,3390-99	(1)	1.1	0.8	(1)	87	104
Nonferrous metals and products.....	333-36	3.5	1.5	0.8	262	99	87
Fabricated metal products.....	34	3.8	(2)	1.8	240	(2)	128
Machinery.....	35	17.0	8.3	9.1	6,366	908	1,437
Office, computing, and accounting machines.....	357	18.2	9.5	8.0	6,297	760	720
Other machinery, except electrical.....	351-56,358-59	6.8	4.3	3.1	876	391	337
Electrical equipment.....	36	11.7	10.1	13.3	9,271	2,939	3,285
Radio and TV receiving equipment.....	365	6.6	0.5	(2)	150	31	30
Communication equipment.....	366	10.5	14.6	11.2	6,230	1,537	1,006
Electronic components.....	367	12.2	14.0	9.0	1,857	629	449
Other electrical equipment.....	361-64,369	(1)	7.8	1.4	(1)	260	197
Transportation equipment.....	37	8.5	14.1	8.4	14,141	6,347	5,003
Motor vehicles and motor vehicles equipment.....	371	(1)	4.4	1.3	(1)	421	125
Other transportation equipment.....	373-75,379	(1)	(2)	0.2	(1)	(2)	6
Aircraft and missiles.....	372,376	21.2	12.7	11.1	9,066	4,623	2,453
Professional and scientific instruments.....	38	13.2	11.1	10.2	3,188	927	625
Scientific and mechanical measuring instruments....	381-82	14.0	13.2	10.4	1,781	285	248
Optical, surgical, photographic, and other instruments.....	383-87	11.8	6.7	5.2	2,333	220	143
Other manufacturing industries.....	27,31,39	3.3	(2)	1.0	165	77	90

Note: Rankings are based on total R&D funds.

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation, SRS

Table B-24. Company R&D funds as a percent of net sales in R&D-performing manufacturing companies ranked by size of company R&D program by industry: 1986

Industry	SIC code	Percent company funds of net sales			Company R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		6.1	5.7	5.7	912,421	94,357	96,849
Food, kindred, and tobacco products.....	20,21	1.1	0.9	0.8	448	154	261
Textiles and apparel.....	22,23	1.6	(2)	0.3	86	(2)	26
Lumber, wood products, and furniture.....	24,25	1.0	1.1	0.5	100	24	30
Paper and allied products.....	26	4.0	1.3	0.5	629	96	112
Chemicals and allied products.....	28	6.3	7.5	6.5	2,462	1,380	2,394
Industrial chemicals.....	281-82,286	6.3	4.5	3.0	2,462	606	594
Drugs and medicines.....	283	12.8	6.8	8.8	1,261	911	1,431
Other chemicals.....	284-85,287-89	3.5	(2)	2.2	609	(2)	203
Petroleum refining.....	29	1.5	1.0	0.6	1,170	513	183
Rubber products.....	30	3.1	4.5	2.2	419	153	131
Stone, clay, and glass products.....	32	3.2	1.2	0.8	284	100	73
Primary metals.....	33	1.1	(2)	1.3	292	(2)	224
Ferrous metals and products.....	331-32,3390-99	0.6	1.1	0.9	157	87	101
Nonferrous metals and products.....	333-36	3.4	1.3	0.7	257	85	73
Fabricated metal products.....	34	3.0	(2)	1.3	201	(2)	118
Machinery.....	35	13.6	8.2	8.5	5,087	894	1,342
Office, computing, and accounting machines.....	357	14.5	9.0	7.8	5,024	724	712
Other machinery, except electrical.....	351-56,358-59	6.1	4.3	2.9	795	391	325
Electrical equipment.....	36	6.6	6.9	5.9	4,920	1,530	2,125
Radio and TV receiving equipment.....	365	6.5	0.4	2.6	150	29	24
Communication equipment.....	366	(1)	3.3	4.3	(1)	778	395
Electronic components.....	367	12.7	(2)	7.8	1,401	559	413
Other electrical equipment.....	361-64,369	4.1	8.2	1.3	1,902	239	182
Transportation equipment.....	37	4.5	3.8	2.7	7,810	1,997	1,338
Motor vehicles and motor vehicles equipment.....	371	4.0	3.2	0.8	6,809	336	74
Other transportation equipment.....	373-75,379	(1)	(2)	0.2	(1)	(2)	6
Aircraft and missiles.....	372,376	5.3	3.1	2.4	2,743	861	490
Professional and scientific instruments.....	38	11.4	8.8	7.0	2,761	694	473
Scientific and mechanical measuring instruments.....	381-82	11.1	6.1	11.5	1,309	187	221
Optical, surgical, photographic, and other instruments.....	383-87	10.6	6.2	5.0	2,146	182	140
Other manufacturing industries.....	27,31,39	3.0	(2)	1.0	153	70	90

Note: Rankings are based on company R&D fun

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-25. Federal R&D funds as a percent of net sales in R&D performing manufacturing companies ranked by size of Federal R&D program by industry: 1986

Industry	SIC code	Percent Federal funds of net sales			Federal R&D funds [Dollars in millions]		
		First 4 companies	Next 4 companies	Next 12 companies	First 4 companies	Next 4 companies	Next 12 companies
Total.....		5.6	11.2	4.7	98,455	94,413	97,804
Food, kindred, and tobacco products.....	20,21	(2)	0.0	0.0	(2)	0	0
Textiles and apparel.....	22,23	(2)	0.0	0.0	(2)	0	0
Lumber, wood products, and furniture.....	24,25	(2)	0.0	0.0	(2)	0	0
Paper and allied products.....	26	(2)	0.0	0.0	(2)	0	0
Chemicals and allied products.....	28	0.6	0.2	(1)	219	23	6
Industrial chemicals.....	281-82,286	0.6	0.2	(1)	219	23	5
Drugs and medicines.....	283	(2)	0.0	0.0	(2)	0	0
Other chemicals.....	284-85,287-89	0.0	0.0	0.0	0	0	0
Petroleum refining.....	29	(2)	0.0	0.0	(2)	(1)	0
Rubber products.....	30	2.8	(2)	0.0	298	(2)	0
Stone, clay, and glass products.....	32	(2)	0.0	0.0	(2)	0	0
Primary metals.....	33	(2)	0.1	(1)	(2)	7	1
Ferrous metals and products.....	331-32,3398-99	(2)	(2)	0.0	(2)	(2)	0
Nonferrous metals and products.....	333-36	0.5	(1)	0.0	33	(1)	0
Fabricated metal products.....	34	1.8	(2)	(2)	72	(2)	(2)
Machinery.....	35	(2)	2.2	0.3	(2)	61	22
Office, computing, and accounting machines.....	357	(2)	(2)	0.0	(2)	(2)	0
Other machinery, except electrical.....	351-56,358-59	1.8	(2)	0.1	95	15	3
Electrical equipment.....	36	5.8	7.0	5.5	4,768	1,479	1,169
Radio and TV receiving equipment.....	365	6.3	0.0	0.0	9	0	0
Communication equipment.....	366	4.3	13.3	8.6	2,542	978	288
Electronic components.....	367	3.8	1.4	0.2	533	43	7
Other electrical equipment.....	361-64,369	(2)	0.2	(3)	(2)	4	(1)
Transportation equipment.....	37	5.8	9.4	4.5	7,708	3,747	3,280
Motor vehicles and motor vehicles equipment.....	371	(2)	0.5	(2)	(2)	24	(2)
Other transportation equipment.....	373-75,379	(2)	0.0	0.0	(2)	0	0
Aircraft and missiles.....	372,376	16.2	10.0	7.7	6,916	3,244	1,928
Professional and scientific instruments.....	38	4.8	0.6	0.3	780	40	25
Scientific and mechanical measuring instruments.....	381-82	(2)	1.0	(2)	(2)	18	(2)
Optical, surgical, photographic, and other instruments.....	383-87	(2)	0.8	(2)	(2)	6	(2)
Other manufacturing industries.....	27,31,39	(2)	(2)	0.0	(2)	(2)	0

Notes: Rankings are based on Federal R&D funds.

(1) Less than 0.05 percent or \$0.5 million.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-26. Funds for basic research, applied research, and development performance: 1953-89 (estimated)
(In current and constant 1982 dollars)

[Dollars in millions]

Year	Total		Basic research		Applied research		Development	
	current dollars	constant dollars	current dollars	constant dollars	current dollars	constant dollars	current dollars	constant dollars
1953.....	83,630	814,021	8151	8583	8726	82,804	82,753	810,633
1954.....	4,870	15,475	166	631	814	3,095	3,090	11,749
1955.....	4,640	17,090	189	696	928	3,418	3,523	12,976
1956.....	6,605	23,530	253	901	1,268	4,517	5,084	18,112
1957.....	7,731	26,585	271	932	1,670	5,743	5,790	19,911
1958.....	8,389	28,274	295	994	1,911	6,441	6,183	20,839
1959.....	9,618	31,597	320	1,051	1,991	6,541	7,307	24,005
1960.....	10,509	33,935	376	1,215	2,029	6,556	8,104	26,184
1961.....	10,908	34,917	395	1,264	1,977	6,328	8,537	27,327
1962.....	11,464	35,892	488	1,528	2,449	7,668	8,527	26,697
1963.....	12,630	38,981	522	1,611	2,457	7,583	9,651	29,787
1964.....	13,512	41,032	549	1,667	2,600	7,896	10,362	31,467
1965.....	14,185	41,992	592	1,753	2,658	7,869	10,934	32,368
1966.....	15,548	44,474	624	1,785	2,843	8,132	12,081	34,557
1967.....	16,385	45,590	629	1,750	2,915	8,111	12,842	35,732
1968.....	17,029	46,194	642	1,702	3,124	8,280	13,663	36,213
1969.....	18,388	46,823	618	1,554	3,287	8,263	14,403	36,207
1970.....	18,067	42,906	602	1,432	3,427	8,154	14,038	33,480
1971.....	18,320	41,280	590	1,329	3,415	7,695	14,315	32,254
1972.....	19,552	42,856	593	1,276	3,514	7,559	15,445	33,222
1973.....	21,249	42,893	631	1,274	3,825	7,721	16,793	33,898
1974.....	22,887	42,415	699	1,295	4,288	7,947	17,900	33,173
1975.....	24,187	40,781	730	1,231	4,578	7,705	18,887	31,845
1976.....	26,997	42,805	819	1,299	5,112	8,105	21,066	33,401
1977.....	29,825	44,330	911	1,354	5,636	8,377	23,278	34,599
1978 (NSF estimate).....	33,304	46,115	1,035	1,433	6,300	8,723	25,969	35,958
1979.....	38,226	48,652	1,158	1,474	7,225	9,196	29,843	37,983
1980 (NSF estimate).....	44,505	51,919	1,325	1,546	8,450	9,858	34,730	40,516
1981.....	51,810	55,140	1,614	1,718	10,699	11,387	39,497	42,836
1982 (NSF estimate).....	57,996	57,996	1,880	1,880	12,175	12,175	43,940	43,940
1983.....	63,403	61,047	2,152	2,072	13,505	13,003	47,746	45,972
1984.....	71,460	66,332	2,475	2,297	15,024	13,946	53,961	50,089
1985.....	78,268	70,544	2,622	2,363	16,915	15,246	58,732	52,936
1986 (NSF estimate).....	88,629	70,771	2,568	2,254	15,611	13,702	62,452	54,816
1987 (NSF estimate).....	84,680	71,896	2,600	2,210	16,200	13,767	65,800	55,919
1988 (NSF estimate).....	89,600	73,927	2,800	2,310	17,100	14,109	69,700	57,508
1989 (NSF estimate).....	94,150	74,788	3,100	2,462	17,900	14,219	73,150	58,106

Notes: NSF estimates are published in National Science Foundation, National Patterns of R&D Resources, 1989 (NSF 89-308). The 1982 GNP implicit price deflator was used to convert current to constant dollars.

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Table B-27. Funds for basic research, applied research, and development by industry and size of company: 1985

[Dollars in millions]

Industry and size of company	SIC code	Total	Basic research	Applied research	Development
Total.....		\$78,268	\$2,622	\$16,915	\$58,732
Distribution by industry					
Food, kindred, and tobacco products.....	20,21	(1)	61	(1)	453
Textiles and apparel.....	22,23	(1)	(1)	29	123
Lumber, wood products, and furniture.....	24,25	172	(2)	(2)	(2)
Paper and allied products.....	26	(1)	(1)	389	406
Chemicals and allied products.....	28	8,690	709	3,227	(2)
Industrial chemicals.....	281-82,286	3,899	362	(2)	(2)
Drugs and medicines.....	283	3,582	295	(2)	(2)
Other chemicals.....	284-85,287-89	1,209	52	318	838
Petroleum refining.....	29	(1)	161	(1)	1,147
Rubber products.....	30	(1)	(1)	(2)	(2)
Stone, clay, and glass products.....	32	(1)	(1)	122	382
Primary metals.....	33	(1)	67	174	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	(1)	(1)	(1)
Nonferrous metals and products.....	333-36	428	(1)	(1)	285
Fabricated metal products.....	34	628	7	159	(2)
Machinery.....	35	10,853	(1)	1,503	(1)
Office, computing, and accounting machines.....	357	(1)	(1)	1,122	7,271
Other machinery, except electrical.....	351-56,358-59	(1)	70	381	(1)
Electrical equipment.....	36	17,055	495	3,082	13,305
Radio and TV receiving equipment.....	365	(1)	(1)	(1)	(2)
Communication equipment.....	366	8,816	277	1,397	7,141
Electronic components.....	367	2,778	169	(2)	(2)
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)
Transportation equipment.....	37	(1)	358	4,341	(1)
Motor vehicles and motor vehicles equipment.....	371	7,035	(1)	(1)	6,509
Other transportation equipment.....	373-75,379	(1)	(1)	(1)	(1)
Aircraft and missiles.....	372,376	17,918	308	3,847	13,764
Professional and scientific instruments.....	38	5,303	(2)	(2)	(2)
Scientific and mechanical measuring instruments..	381-82	(1)	(1)	(2)	(2)
Optical, surgical, photographic, and other instruments.....	383-87	(1)	(1)	(2)	(2)
Other manufacturing industries.....	27,31,39	(1)	(1)	54	324
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	2,914	247	738	1,928
Distribution by size of company (based on number of employees)					
Less than 500.....		2,608	327	536	1,745
500 to 999.....		962	36	(2)	697
1,000 to 4,999.....		4,546	235	1,519	2,793
5,000 to 9,999.....		3,999	107	1,360	2,531
10,000 to 24,999.....		10,335	407	2,929	6,999
25,000 or more.....		55,819	1,510	10,342	43,967

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table D-26. Funds for basic research, applied research, and development
by industry, source of funds, and size of company: 1985

(Dollars in millions)

Industry and size of company	SIC code	Total basic	Federal basic	Company basic	Total applied	Federal applied	Company applied	Total develop- ment	Federal develop- ment	Company develop- ment
Total.....		82,622	8482	92,140	816,915	85,275	811,640	858,732	821,073	837,658
Distribution by industry										
Food, kindred, and tobacco products.....	20,21	61	0	61	(1)	(1)	(2)	453	(1)	(2)
Textiles and apparel.....	22,23	(1)	0	(1)	29	(1)	(1)	123	(1)	(1)
Lumber, wood products, and furniture.....	24,25	(2)	0	(2)	(2)	0	(2)	(2)	0	(2)
Paper and allied products.....	26	(1)	0	(1)	389	(1)	(1)	406	(1)	(1)
Chemicals and allied products.....	28	709	6	703	3,227	151	3,076	(2)	142	(2)
Industrial chemicals.....	281-82,286	362	6	356	(2)	134	(2)	(2)	141	(2)
Drugs and medicines.....	283	295	0	295	(2)	(1)	(2)	(2)	(1)	(2)
Other chemicals.....	284-85,287-89	52	0	52	318	(1)	(1)	838	(1)	(1)
Petroleum refining.....	29	161	(1)	(1)	(1)	(1)	796	1,147	3	1,144
Rubber products.....	30	(1)	0	(2)	(2)	(2)	(2)	(2)	(1)	(2)
Stone, clay, and glass products.....	32	(1)	0	(1)	122	(1)	(1)	382	(1)	(1)
Primary metals.....	33	67	(1)	(1)	174	(1)	(1)	(1)	(1)	515
Ferrous metals and products.....	331-32,3398-99	(1)	0	(1)	(1)	(1)	91	(1)	(1)	269
Nonferrous metals and products.....	333-34	(1)	(1)	(1)	(1)	(1)	(2)	285	(2)	246
Fabricated metal products.....	34	7	0	7	159	(2)	152	(2)	(2)	(2)
Machinery.....	35	(1)	(1)	173	1,503	(1)	(1)	(1)	(1)	8,086
Office, computing, and accounting machines.....	357	(1)	(1)	(1)	1,122	(1)	(1)	7,271	(1)	(1)
Other machinery, except electrical.....	351-56,358-99	70	(1)	(1)	381	(2)	361	(1)	(1)	(1)
Electrical equipment.....	36	495	103	392	3,082	987	2,095	13,305	5,784	7,521
Radio and TV receiving equipment.....	365	(1)	0	(1)	(1)	(1)	(2)	(2)	(1)	(1)
Communication equipment.....	366	277	45	232	1,397	455	942	7,141	3,093	4,048
Electronic components.....	367	169	(1)	(1)	(2)	(1)	(1)	(2)	(2)	(1)
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Transportation equipment.....	37	358	175	183	4,341	(1)	(1)	(1)	11,499	(1)
Motor vehicles and motor vehicles equipment.....	371	(1)	(1)	(1)	(1)	(1)	(1)	6,509	(2)	5,818
Other transportation equipment.....	373-75,379	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)
Aircraft and missiles.....	372,376	308	166	142	3,847	2,839	1,008	13,764	10,721	3,043
Professional and scientific instruments.....	38	(2)	(1)	(2)	(2)	(1)	(2)	(2)	(2)	(2)
Scientific and mechanical measuring instruments..	381-82	(1)	(1)	(2)	(2)	(1)	(2)	(2)	(1)	(2)
Optical, surgical, photographic, and other										
instruments.....	383-87	(1)	(1)	(2)	(2)	(1)	(2)	(2)	(1)	(2)
Other manufacturing industries.....	27,31,39	(1)	0	(1)	54	(1)	(1)	324	(1)	(1)
Nonmanufacturing industries.....	10-17,41-47,737, 739,807,891	247	(2)	53	738	520	218	1,928	815	1,113
Distribution by size of company (based on number of employees)										
Less than 500.....		327	(2)	(2)	536	33	503	1,745	294	1,451
500 to 999.....		36	(1)	(1)	(2)	(2)	(2)	697	(1)	(1)
1,000 to 4,999.....		235	(1)	(1)	1,519	233	1,286	2,793	(1)	(1)
5,000 to 9,999.....		107	(1)	(1)	1,360	171	1,189	2,531	(1)	(1)
10,000 to 24,999.....		407	(1)	(1)	2,929	260	2,669	6,999	(1)	(1)
25,000 or more.....		1,510	258	1,252	10,342	4,506	5,836	43,967	17,835	26,132

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of more than 50 percent.

(3) Less than 80.5 million.

SOURCE: National Science Foundation, SRS

Table B-29- Funds for basic research by industry and size of company:
1957-58, 1963, 1967, 1972, 1974-77, 1979, 1981, and 1983-85

(Dollars in millions)

DATA NOT AVAILABLE FOR 1966		(dollars in millions)															
Industry and size of company	SIC code	1957	1958	1963	1967	1972	1974	1975	1976	1977	1979	1981	1983	1984	1985		
Total.....		\$271	\$295	\$522	\$629	\$593	\$699	\$730	\$819	\$911	\$1,156	\$1,614	\$2,152	\$2,475	\$2,622		
Distribution by industry																	
Food, kindred, and tobacco products(8).....	20,21	4	5	12	17	13	9	10	18	20	17	27	34	36	61		
Textiles and apparel.....	22,23	1	1	1	2	2	2	(2)	(2)	(2)	(2)	1	(2)	2	(1)		
Lumber, wood products, and furniture.....	24,25	0	0	0	0	(2)	(2)	3	5	7	5	(2)	(2)	7	(4)		
Paper and allied products.....	26	1	(2)	2	4	4	7	5	6	9	18	32	(2)	61	(1)		
Chemicals and allied products.....	28	82	92	152	184	214	288	294	304	337	366	539	(2)	672	709		
Industrial chemicals.....	281-82,286	(2)	(2)	105	(2)	117	157	154	154	163	197	335	(2)	338	362		
Drugs and medicines.....	283	18	21	33	45	78	107	112	119	134	143	(2)	(2)	(4)	295		
Other chemicals.....	284-85,287-89	6	6	14	14	19	24	27	32	40	(2)	24	(2)	41	52		
Petroleum refining.....	29	35	34	34	36	22	33	36	44	48	74	(2)	(2)	209	161		
Rubber products.....	30	4	(2)	8	5	6	5	4	7	9	18	23	(2)	26	(1)		
Stone, clay, and glass products.....	32	(3)	(3)	6	(2)	18	21	32	38	41	40	(2)	(2)	79	(1)		
Primary metals.....	33	6	7	11	13	9	9	14	16	14	24	46	37	57	67		
Ferrous metals and products.....	331-32,3398-99	5	5	8	(2)	(2)	(2)	4	5	5	12	(2)	(2)	9	(1)		
Nonferrous metals and products.....	333-36	(2)	2	3	4	(2)	(2)	16	12	9	12	16	(2)	48	(1)		
Fabricated metal products.....	34	1	1	5	3	7	3	5	2	2	4	8	4	7	7		
Machinery.....	35	17	20	25	26	24	28	32	36	37	66	120	121	(1)	(1)		
Office, computing, and accounting machines.....	357	(5)	(5)	(5)	(5)	(2)	(2)	26	38	41	51	(2)	(2)	(1)	(1)		
Other machinery, except electrical.....	351-56,358-59	(6)	(6)	(6)	(6)	(6)	(6)	(6)	18	16	15	(2)	(2)	(1)	70		
Electrical equipment.....	36	53	63	133	131	137	143	132	163	181	228	279	433	471	495		
Radio and TV receiving equipment.....	365	(7)	(7)	(7)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)		
Communication equipment.....	366					108	116	109	137	150	195	(2)	205	272	277		
Electronic components.....	367	36	43	110	112	10	5	4	5	6	7	(2)	(2)	152	169		
Other electrical equipment.....	361-64,369	17	21	23	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(1)	(1)		
Transportation equipment.....	37													318	358		
Motor vehicles and motor vehicles equipment.....	371	5	(2)	28	(2)	10	9	10	8	12	(2)	(2)	(2)	24	(1)		
Other transportation equipment.....	373-75,379					(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(4)	(1)		
Aircraft and missiles.....	372,374	25	26	59	73	62	57	54	54	55	88	138	146	259	308		
Professional and scientific instruments....	38	8	10	(2)	(2)	17	16	16	23	24	(2)	40	(2)	125	(4)		
Scientific and mechanical measuring instruments.....	381-82	3	2	1	(2)	6	5	9	10	12	(2)	(2)	(2)	(1)	(1)		
Optical, surgical, photographic, and other instruments.....	383-87	6	8	(2)	(2)	11	11	8	12	12	(2)	(2)	(2)	(1)	(1)		
Other manufacturing industries.....	27,31,39	13	8	3	5	5	6	(2)	(2)	(2)	42	21	(2)	(1)	(1)		
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	(2)	(2)	28	52	28	26	25	29	44	57	(2)	(2)	226	247		
Distribution by size of company (based on number of employees)																	
Less than 500.....		(2)	(2)	(2)	56	36	34	57	68	75	98	153	242	397	327		
500 to 999.....														(1)	36		
1,000 to 4,999.....		24	32	31	45	45	47	34	52	54	69	179	267	(1)	235		
5,000 to 9,999.....					50	58	88	107	119	125	158	118	120	137	107		
10,000 to 24,999.....		218	240	439		90	102	96	138	168	211	229	402	485	407		
25,000 or more.....					478	364	428	440	443	489	622	935	1,101	1,101	1,510		

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Not separately available but included in total. See general notes.

(3) Data included in the other manufacturing industries group.

(4) Data have been withheld due to imputation of 50 percent or more.

(5) Data not tabulated at this level prior to 1972.

(6) Data not tabulated at this level prior to 1975.

(7) Included in the other electrical equipment group.

(8) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

Table B-30. Funds for basic research by field of science and engineering:
1967, 1972-77, 1979, 1981, 1983, and 1985

	[Dollars in millions]										
Field of science and engineering	1967	1972	1973	1974	1975	1976	1977	1979	1981	1983	1985
Total.....	8629	8593	8631	8699	8730	8819	8911	\$1,158	\$1,614	\$2,152	\$2,622
Physical sciences.....	308	277	276	319	320	340	405	527	746	922	902
Chemistry.....	162	183	193	229	228	253	285	381	485	568	514
Physics.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	379
Astronomy.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	9
Mathematics.....	12	12	14	13	14	18	19	20	26	28	34
Computer sciences.....											60
Environmental sciences.....	14	6	7	10	15	17	19	13	18	30	21
Atmospheric sciences.....	(1)	(1)	2	3	6	6	5	5	12	17	(2)
Geological sciences.....	(1)	4	3	5	5	7	7	6	6	13	13
Oceanography.....	(1)	(1)	1	1	3	4	7	2	0	0	(3)
Engineering (including metallurgy).....	172	183	185	178	191	204	233	292	458	698	926
Life sciences.....	69	82	102	119	122	134	156	177	208	282	(3)
Biological sciences.....	(1)	61	77	83	85	102	128	136	157	246	319
Clinical medical sciences.....	(1)	21	25	36	37	32	28	40	51	36	(3)
Other sciences.....	53	33	47	60	67	85	78	128	158	192	(3)

NOTE: Data not collected for 1978, 1980, 1982, 1984, or 1986.

(1) Not separately available but included in total. See general notes.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-31. Funds for basic research by industry and field of science and engineering: 1985

[Dollars in millions]

DATA NOT COLLECTED FOR 1986

Industry	SIC Code	Total	Physical sciences	Mathematics	Computer sciences	Environ- mental sciences	Engineering (including metallurgy)	Life sciences	Other sciences
Total.....		\$2,622	\$902	\$34	\$60	\$21	\$926	(2)	(2)
Food, kindred, and tobacco products.....	20,21	61	24	2	0	0	9	(2)	(2)
Textiles and apparel.....	22,23	(1)	(2)	0	0	0	(2)	0	(2)
Lumber, wood products, and furniture.....	24,25	(2)	0	0	0	0	(2)	0	0
Paper and allied products.....	26	(1)	(1)	0	0	0	17	(1)	(1)
Chemicals and allied products.....	28	709	219	(3)	0	0	15	(2)	(2)
Industrial chemicals.....	281-52,286	362	158	(3)	0	0	9	(2)	(2)
Drugs and medicines.....	283	295	21	0	0	0	4	(2)	(2)
Other chemicals.....	284-85,287-89	52	(2)	0	0	0	1	(2)	(2)
Petroleum refining.....	29	161	(1)	(3)	(3)	(1)	(1)	(2)	(1)
Rubber products.....	30	(1)	(1)	0	0	0	0	0	(2)
Stone, clay, and glass products.....	32	(1)	(1)	(1)	0	0	(1)	(1)	(1)
Primary metals.....	33	67	(1)	0	(1)	0	(1)	0	0
Ferrous metals and products.....	331-32,3398-99	(1)	1	0	(1)	0	(1)	0	0
Nonferrous metals and products.....	333-36	(1)	(1)	0	2	0	(1)	0	0
Fabricated metal products.....	34	7	0	0	0	0	7	0	(2)
Machinery.....	35	(1)	(1)	(1)	11	2	43	(1)	(1)
Office, computing, and accounting machines.....	357	(1)	(1)	(1)	11	(1)	(1)	(1)	0
Other machinery, except electrical.....	351-56,358-59	70	31	0	(3)	(1)	(1)	(2)	(1)
Electrical equipment.....	36	495	117	15	34	1	288	(2)	(2)
Radio and TV receiving equipment.....	365	(1)	(1)	0	0	0	0	0	0
Communication equipment.....	366	277	83	13	31	0	89	0	(2)
Electronic components.....	367	169	(1)	0	0	0	(2)	0	0
Other electrical equipment.....	361-64,369	(1)	22	1	3	1	15	(2)	(2)
Transportation equipment.....	37	358	(1)	4	(1)	(1)	172	(1)	(1)
Motor vehicles and motor vehicles equipment.....	371	(1)	(1)	(1)	(1)	(1)	11	(1)	(1)
Other transportation equipment.....	373-75,379	(1)	(3)	0	0	0	0	0	0
Aircraft and missiles.....	372,376	308	78	(1)	7	2	161	(2)	(1)
Professional and scientific instruments....	38	(2)	(2)	0	(2)	(2)	(2)	(2)	(2)
Scientific and mechanical measuring instruments.....	381-82	(1)	(2)	0	(2)	(2)	(2)	0	(2)
Optical, surgical, photographic, and other instruments.....	383-87	(1)	(2)	0	0	0	(2)	(2)	(2)
Other manufacturing industries.....	27,31,39	(1)	(2)	(2)	0	0	(2)	0	(2)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	247	(2)	(3)	0	(2)	(2)	(2)	(2)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

(3) Less than \$0.5 million.

SOURCE: National Science Foundation, SRS

Table D-32. R&D-performing companies conducting basic research
by industry and size of company: 1986

by industry and size of company: 1986		Companies with total employment of--											
Industry and size of company		less than 500		500 to 999		1,000 to 4,999		5,000 to 9,999		10,000 to 24,999		25,000 or more	
SIC code		R&D	Basic research	R&D	Basic research	R&D	Basic research	R&D	Basic research	R&D	Basic research	R&D	Basic research
Total.....		9,411	443	472	33	666	68	164	27	172	49	110	56
Food, kindred, and tobacco products.....	20,21	137	0	38	0	47	1	18	6	14	3	14	6
Textiles and apparel.....	22,23	244	1	10	0	25	0	11	2	5	1	5	1
Lumber, wood products, and furniture.....	24,25	119	56	11	0	24	1	7	0	6	1	2	0
Paper and allied products.....	26	21	0	9	0	24	4	6	0	12	3	4	2
Chemicals and allied products.....	28	1,073	220	34	3	53	17	12	6	20	10	10	7
Industrial chemicals.....	281-82,286	289	1	7	2	11	5	7	4	5	1	6	5
Drugs and medicines.....	283	89	12	7	0	11	4	2	1	9	6	3	2
Other chemicals.....	284-85,287-89	695	207	20	1	31	8	3	1	6	3	1	0
Petroleum refining.....	29	57	0	2	0	2	1	2	1	5	3	8	6
Rubber products.....	30	632	0	38	0	23	0	6	1	6	3	1	1
Stone, clay, and glass products.....	32	86	0	23	0	15	1	7	0	8	3	3	2
Primary metals.....	33	455	0	13	1	40	4	11	1	11	4	5	3
Ferrous metals and products.....	331-32,3390-99	370	0	4	1	25	3	7	1	6	1	4	2
Nonferrous metals and products.....	333-36	85	0	9	0	15	1	4	0	5	3	1	1
Fabricated metal products.....	34	565	7	46	0	43	2	11	0	8	1	1	0
Machinery.....	35	2,101	60	90	21	98	11	19	0	14	4	11	2
Office, computing, and accounting machines.....	357	145	3	17	8	25	2	4	0	3	0	7	1
Other machinery, except electrical.....	351-56,358-59	1,956	57	73	13	73	9	15	0	11	4	4	1
Electrical equipment.....	36	1,472	30	52	3	83	6	11	2	21	3	12	9
Radio and TV receiving equipment.....	365	171	0	7	0	6	1	1	0	2	1	0	0
Communication equipment.....	366	296	28	5	1	11	0	2	0	6	0	6	4
Electronic components.....	367	667	1	13	0	28	3	2	1	5	2	3	3
Other electrical equipment.....	361-64,369	338	1	27	2	38	2	6	1	8	0	3	2
Transportation equipment.....	37	103	0	27	2	47	1	8	1	9	3	18	11
Motor vehicles and motor vehicles equipment.....	371	13	0	18	0	30	0	5	0	4	2	6	3
Other transportation equipment.....	373-75,379	29	0	3	0	8	0	1	1	1	0	1	0
Aircraft and missiles.....	372,376	61	0	6	2	9	1	2	0	4	1	11	8
Professional and scientific instruments....	38	847	22	36	2	39	8	8	2	4	1	5	4
Scientific and mechanical measuring instruments.....	381-82	307	9	22	0	21	6	3	1	3	1	2	2
Optical, surgical, photographic, and other instruments.....	383-87	540	13	14	2	18	2	5	1	1	0	3	2
Other manufacturing industries.....	27,31,39	365	10	16	0	37	3	5	1	9	1	3	0
Nonmanufacturing industries.....	10-17,41-67,737,739,807,891	1,134	37	27	1	66	8	22	4	20	5	8	2

SOURCE: National Science Foundation, SRS

Table B-33. Funds for applied research and development by product field: 1963-64, 1967-77, 1979, 1981, 1983, and 1985

DATA NOT COLLECTED FOR 1986		[Dollars in millions]																
Product field	SIC Code	1963	1964	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1981	1983	1985(1)
Total.....		\$12,108	\$12,962	\$15,757	\$16,787	\$17,690	\$17,465	\$17,730	\$18,959	\$20,618	\$22,188	\$23,457	\$26,178	\$28,914	\$37,068	\$50,196	\$61,251	\$64,255
Food and kindred products.....	20	102	118	134	165	179	206	211	227	243	283	273	308	348	420	492	636	424
Textile mill products.....	22	(2)	(2)	55	58	66	55	60	83	93	82	73	81	96	(2)	(2)	(2)	214
Chemicals, except drugs and medicines.....	28, except 283	861	949	1,119	1,168	1,214	1,339	1,345	1,250	1,342	1,564	1,627	1,853	2,018	2,501	3,767	4,033	2,859
Industrial inorganic and organic chemicals.....	281,286	242	304	347	396	417	442	457	451	489	589	665	728	819	(2)	1,020	1,146	746
Plastics materials and synthetic resins, rubber, and fibers.....	282	379	402	474	466	482	521	511	453	511	589	588	674	744	881	1,060	1,360	1,050
Agricultural chemicals.....	287	45	48	92	99	104	126	130	108	114	137	176	205	236	292	487	587	432
Other chemicals.....	284-85,289	196	195	205	207	210	223	218	238	229	248	198	246	220	(2)	700	940	631
Drugs and medicines.....	283	227	234	346	375	417	474	535	531	605	683	783	883	955	1,089	1,837	2,601	1,654
Petroleum refining.....	29	194	205	215	239	252	272	266	299	319	363	408	425	471	650	975	929	934
Rubber and miscellaneous plastics products.....	30	87	102	132	160	163	193	215	279	294	341	324	325	376	407	(2)	(2)	332
Stone, clay, and glass products.....	32	74	85	121	130	157	128	128	135	162	181	150	171	191	235	240	194	174
Primary metals.....	33	152	164	208	207	224	235	230	245	272	311	290	311	327	478	684	558	261
Ferrous metals and products.....	331-32,3398-99	90	97	117	119	125	127	114	137	158	156	144	163	172	225	268	278	105
Nonferrous metals and products.....	333-36	62	68	91	88	99	108	116	108	114	155	147	148	155	213	416	280	156
Fabricated metal products.....	34, except 348	135	150	204	478	504	622	701	731	769	903	916	1,025	1,152	1,381	1,518	1,379	1,332
Ordnance and accessories, n.e.c.....	348	92	94	218	201	186	192	192	117	228	222	187	199	288	316	453	(2)	413
Machinery.....	35	913	970	1,293	1,396	1,562	1,676	1,783	1,981	2,307	2,689	2,628	3,001	3,554	4,561	6,288	7,452	7,390
Engines and turbines.....	351	124	126	192	203	196	204	246	316	360	482	464	477	528	589	904	1,199	718
Farm machinery and equipment.....	352	76	79	102	96	99	89	90	93	120	131	138	168	221	295	278	290	228
Construction, mining, and materials handling machinery.....	353	58	60	119	129	154	182	196	206	265	283	285	317	376	632	569	506	423
Metalworking machinery and equipment.....	354	58	66	67	90	83	86	84	76	69	74	80	83	125	340	227	244	129
Office, computing, and accounting machines.....	357	412	458	614	678	812	863	903	1,028	1,219	1,422	1,339	1,580	1,849	1,961	3,220	4,091	5,579
Other machinery, except electrical.....	355-56,358-59	185	182	199	201	218	252	264	270	274	297	322	376	455	744	1,090	1,122	313
Electrical equipment, except radio and TV receiving equipment, communication equipment, and electronic components.....	36, except 365-67; 3825	277	305					488	775	857	929	774	874	901	980	1,724	1,874	1,153
Electric transmission and distribution equipment..	361,3825	47	46					181	189	204	239	205	224	224	191	(2)	(2)	150
Electrical industrial apparatus.....	362	77	84	3,053	3,363	3,409	3,372	187	231	263	264	260	306	298	291	(2)	(2)	382
Other electrical equipment and supplies.....	363-64,368-69	152	175					320	355	390	426	309	344	379	498	653	1,003	621
Radio and TV receiving equipment, communication equipment, and electronic components.....	365-67	2,150	2,223					2,927	3,234	3,621	3,896	3,911	4,483	5,019	6,696	(2)	(2)	9,139
Motor vehicles and other transportation equipment... 37, except 372,376	651	678	831	956	1,139	1,138	1,341	1,668	2,014	1,994	1,924	2,263	(2)	(2)	(2)	(2)	(2)	3,647
Motor vehicles and equipment.....	371	623	651	755	860	1,051	1,046	1,228	1,470	1,824	1,784	1,720	(2)	(2)	(2)	(2)	(2)	(1)
Other transportation equipment.....	373-75,379	28	27	76	96	88	90	113	198	190	210	204	193	201	205	(2)	377	(1)
Aircraft and parts.....	372	1,520	1,670	2,165	2,370	2,579	2,556	2,486	2,396	2,548	2,420	2,265	2,733	3,113	3,460	4,924	5,877	3,947
Guided missiles and spacecraft.....	376	3,345	3,496	3,741	3,786	3,711	3,115	2,832	2,647	2,491	2,486	2,925	2,880	3,024	4,465	4,814	6,904	3,959
Professional and scientific instruments.....	38, except 3825	298	346	535	719	814	724	652	847	981	1,090	1,002	1,140	1,255	1,434	1,486	1,812	1,127
Other product fields, n.e.c.....	-	1,030	1,172	1,385	1,013	1,124	1,194	1,177	1,440	1,465	1,742	2,987	3,179	3,201	4,062	5,657	6,681	5,708

n.e.c. Not elsewhere classified.

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Not separately available but included in total. See general notes.

(3) Imputation of R&D expenditures by product field was eliminated beginning in 1985. Therefore, data for each industry are lower than those in preceding years. See Table B-35 for "coverage ratios."

Source: National Science Foundation, SRS

Table B-34. Funds for applied research and development by product field and source of funds: 1985

[Dollars in millions]

Product field	SIC Code	Total	Federal	Company
Total.....		\$44,255	\$15,280	\$28,975
Food and kindred products.....	20	424	0	424
Textile mill products.....	22	214	0	214
Chemicals and allied products.....	28	4,513	43	4,470
Industrial inorganic and organic chemicals.....	281,286	746	19	727
Plastics materials and synthetic resins, rubber, and fibers.....	282	1,050	(1)	(1)
Drugs and medicines.....	283	1,654	8	1,646
Agricultural chemicals.....	287	432	0	432
Other chemicals.....	284-85,289	631	(1)	(1)
Petroleum refining.....	29	934	15	919
Rubber and miscellaneous plastics products.....	30	332	(1)	332
Stone, clay, and glass products.....	32	174	(1)	167
Primary metals.....	33	261	38	224
Ferrous metals and products.....	331-32,3398-99	105	(1)	(1)
Nonferrous metals and products.....	333-36	156	(1)	(1)
Fabricated metal products.....	34	1,332	855	477
Ordnance and accessories, n.e.c.....	348	413	294	119
Other fabricated metal products.....	341-47,349	919	561	358
Machinery.....	35	7,390	378	7,012
Engines and turbines.....	351	718	136	582
Farm machinery and equipment.....	352	228	0	228
Construction, mining, and materials handling machinery.....	353	423	(1)	(1)
Metalworking machinery and equipment.....	354	129	0	129
Office, computing, and accounting machines.....	357	5,579	(1)	(1)
Other machinery, except electrical.....	355-56,358-59	313	94	220
Electrical equipment.....	36	10,292	4,189	6,103
Electric transmission and distribution equipment..	361,3825	150	42	108
Electrical industrial apparatus.....	362	382	173	209
Other electrical equipment and supplies.....	363-64,368-69	621	108	513
Radio and TV receiving equipment, communication equipment, and electronic components.....	365-67	9,139	3,866	5,273
Transportation equipment.....	37	11,554	5,872	5,681
Motor vehicles.....	371	(1)	(1)	(1)
Other transportation equipment.....	373-75,379	(1)	(1)	(1)
Aircraft and parts.....	372	3,947	2,099	1,848
Guided missiles and spacecraft.....	376	3,959	3,695	264
Professional and scientific instruments.....	38, except 3825	1,127	102	1,025
Scientific and mechanical measuring instruments...	381-82	820	(1)	(1)
Optical, surgical, photographic, and other..... instruments.....	383-87	306	(1)	(1)
Other product fields, n.e.c.....	-	5,708	3,781	1,927

n.e.c. Not elsewhere classified.

(1) Data have been withheld to avoid disclosing operations of individual companies.

NOTE: This table contains only data reported by survey respondents. Imputation of R&D expenditures by product field was eliminated beginning in 1985. See Table B-35 for "coverage ratios."

Source: National Science Foundation, SRS

Table B-35. Funds for applied research and development
by industry and product field: 1985

(Dollars in millions)

DATA NOT COLLECTED FOR 1986

Industry	SIC Code	Total	Coverage ratio	Food and kindred products 20	Textile mill products 22	Chemicals 28	Petroleum refining 29	Rubber products 30	Stone, clay, and glass products 32	Primary metals 33	Fabricated metal products 34	Machinery 35	Electrical equipment 36	Transportation equipment 37	Professional and scientific instruments 38	Other product fields N.E.C. ...
Total.....		875,647	0.59	8424	8214	84,513	8934	8332	8174	8261	81,332	87,390	810,292	811,554	81,127	85,708
Food, kindred, and tobacco products.....	20,21	(1)	0.45	265	(1)	34	0	(1)	(1)	0	(1)	8	9	(1)	0	113
Textiles and apparel.....	22,23	152	0.49	0	62	(1)	0	(1)	0	0	(1)	(1)	(1)	(1)	0	(1)
Lumber, wood products, and furniture.....	24,25	(2)	0.38	(1)	0	1	0	0	(1)	0	(1)	(1)	0	0	(1)	47
Paper and allied products.....	26	795	0.23	0	(1)	20	(1)	(1)	0	0	0	25	(1)	(1)	(1)	135
Chemicals and allied products.....	28	7,981	0.58	114	134	3,410	4	80	15	(1)	80	(1)	(1)	4	307	217
Industrial chemicals.....	281-82,286	3,537	0.44	(1)	(1)	1,622	(1)	(1)	(1)	(1)	(1)	(1)	(1)	0	(1)	(1)
Drugs and medicines.....	283	3,287	0.50	(1)	(1)	1,304	0	(1)	(1)	(1)	7	0	(1)	4	115	(1)
Other chemicals.....	284-85,287-89	1,154	0.43	93	(1)	484	(1)	0	(1)	0	(1)	0	(1)	0	(1)	121
Petroleum refining.....	29	(1)	0.96	(1)	0	479	856	(1)	(1)	(1)	(1)	(1)	76	(1)	19	330
Rubber products.....	30	(2)	0.26	(1)	(1)	21	0	139	(1)	(1)	(1)	(1)	(1)	(1)	0	(1)
Stone, clay, and glass products.....	32	594	0.59	0	0	(1)	0	7	114	(1)	(1)	(1)	(1)	27	(1)	17
Primary metals.....	33	(1)	0.69	(1)	0	40	(1)	5	1	132	25	20	49	(1)	(1)	20
Ferrous metals and products.....	331-32,3398-99	839	0.79	0	0	(1)	(1)	(1)	(1)	57	(1)	(1)	(1)	(1)	0	(1)
Nonferrous metals and products.....	333-34	(1)	0.48	(1)	0	(1)	(1)	(1)	(1)	76	(1)	(1)	(1)	(1)	(1)	(1)
Fabricated metal products.....	34	(2)	0.41	(1)	(1)	43	(1)	(1)	(1)	8	72	9	21	23	8	64
Machinery.....	35	(1)	0.82	(1)	0	29	(1)	26	(1)	18	68	6,294	1,157	69	26	1,056
Office, computing, and accounting machines.....	357	8,393	0.88	0	0	16	0	0	0	0	(3)	5,268	1,119	0	18	942
Other machinery, except electrical.....	351-56,358-59	(1)	0.42	(1)	0	13	(1)	26	(1)	18	68	1,025	40	69	8	113
Electrical equipment.....	36	16,387	0.63	0	(1)	86	(1)	5	(1)	7	447	287	5,888	1,074	110	2,432
Radio and TV receiving equipment.....	365	967	0.81	0	0	0	0	0	0	0	0	0	(1)	143	0	0
Communication equipment.....	366	8,538	0.61	0	0	9	0	(1)	(1)	(1)	(1)	(1)	3,358	(1)	(1)	(1)
Electronic components.....	367	(2)	0.24	0	0	(1)	0	0	0	0	0	(1)	(1)	0	12	36
Other electrical equipment.....	361-64,369	4,272	0.84	0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	77	1,365	(1)	(1)	(1)
Transportation equipment.....	37	(1)	0.56	0	(1)	59	(1)	(1)	(1)	(1)	458	577	2,270	9,528	35	825
Motor vehicles and motor vehicles equipment.....	371	(1)	0.62	0	(1)	(1)	(1)	29	(1)	16	(1)	(1)	(1)	(1)	(1)	(1)
Other transportation equipment.....	373-75,379	(2)	0.07	0	0	(1)	0	0	0	0	(1)	(1)	(1)	(1)	0	(1)
Aircraft and missiles.....	372,376	17,611	0.55	0	0	12	(1)	(1)	(1)	(1)	319	207	2,019	6,156	(1)	713
Professional and scientific instruments....	38	(2)	0.17	0	2	15	0	10	0	0	2	(1)	108	11	528	60
Scientific and mechanical measuring instruments.....	381-82	(2)	0.20	0	0	0	0	0	0	0	(1)	(1)	94	6	363	42
Optical, surgical, photographic, and other instruments.....	383-87	(2)	0.12	0	2	15	0	10	0	0	(1)	(1)	13	5	165	18
Other manufacturing industries.....	27,31,39	378	0.46	0	3	70	(1)	(1)	(1)	(1)	(1)	8	11	(1)	(1)	45
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	2,666	0.63	(1)	0	144	18	9	(1)	33	(1)	76	527	252	54	343

(1) Data have been withheld to avoid disclosing operations of individual companies.

NOTE: Imputation of R&D expenditures by product field was eliminated in 1985. Coverage ratios show the percentage of each industry's applied research and development funds that respondents distributed by product field.

Source: National Science Foundation, SRS

Table B-36. Funds for applied research and development by industry and secondary product field: 1985

[Dollars in millions]

DATA NOT COLLECTED FOR 1986		Chemicals				Primary metals		Fabricated metal products	
Industry	SIC Code	Industrial inorganic and organic chemicals 281,286	Plastics, synthetic resins, rubber, and fibers 282	Drugs and medicines 283	Agricultural chemicals 287	Other chemicals 284-85, 289	Ferrous metals and products 331-32, 3398-99	Nonferrous metal and products 333-36	Ordinance and accessories n.e.c. 348
Total.....		\$746	\$1,050	\$1,654	\$432	\$631	\$105	\$156	\$413
Food, kindred, and tobacco products.....	20,21	(1)	5	(1)	(1)	(1)	0	0	(1)
Textiles and apparel.....	22,23	0	(1)	0	0	(1)	0	0	0
Lumber, wood products, and furniture.....	24,25	0	0	0	(1)	(1)	0	0	0
Paper and allied products.....	26	6	(1)	0	0	(1)	0	0	0
Chemicals and allied products.....	28	427	624	1,623	345	390	(1)	(1)	(1)
Industrial chemicals.....	281-82,286	303	603	(1)	251	121	(1)	0	(1)
Drugs and medicines.....	283	33	(1)	1,198	(1)	16	0	(1)	0
Other chemicals.....	284-85,287-89	91	(1)	(1)	(1)	253	0	0	(1)
Petroleum refining.....	29	196	120	0	(1)	(1)	(1)	(1)	0
Rubber products.....	30	0	18	(1)	0	(1)	0	(1)	31
Stone, clay, and glass products.....	32	(1)	(1)	(1)	(1)	(1)	(1)	(1)	0
Primary metals.....	33	14	(1)	0	0	(1)	59	73	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	(1)	0	0	12	(1)	(1)	(1)
Nonferrous metals and products.....	333-36	(1)	(1)	0	0	(1)	(1)	(1)	(1)
Fabricated metal products.....	34	26	(1)	0	0	(1)	0	(1)	(1)
Machinery.....	35	6	(1)	0	0	(1)	(1)	(1)	(1)
Office, computing, and accounting machines.....	357	0	0	0	0	16	0	0	0
Other machinery, except electrical.....	351-56,358-59	6	(1)	0	0	(1)	(1)	(1)	(1)
Electrical equipment.....	36	13	(1)	0	0	(1)	(1)	(1)	(1)
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	0
Communication equipment.....	366	(1)	(1)	0	0	0	0	(1)	(1)
Electronic components.....	367	(1)	(1)	0	0	(1)	0	0	0
Other electrical equipment.....	361-64,369	(1)	(1)	0	0	(1)	(1)	(1)	31
Transportation equipment.....	37	(1)	42	0	0	(1)	(1)	(1)	244
for vehicles and motor vehicles equipment.....	371	(1)	(1)	0	0	(1)	(1)	(1)	(1)
air transportation equipment.....	373-75,379	(1)	(1)	0	0	(1)	0	0	(1)
Aircraft and missiles.....	372,376	(1)	7	0	0	(1)	(1)	(1)	210
Professional and scientific instruments.....	38	(1)	12	0	0	(1)	0	0	(1)
Scientific and mechanical measuring instruments.....	381-82	0	0	0	0	0	0	0	(1)
Optical, surgical, photographic, and other instruments.....	383-87	(1)	12	0	0	(1)	0	0	0
Other manufacturing industries.....	27,31,39	0	(1)	0	0	(1)	(1)	(1)	(1)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	36	45	(1)	(1)	38	21	13	57

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Less than \$0.5 million.

NOTE: Imputation of R&D expenditures by product field was eliminated in 1985. See Table B-35 for "coverage ratios."

DATA NOT COLLECTED FOR 1986

Industry	SIC Code	Machinery						Electrical equipment					
		Engines and turbines 351	Farm machinery and equipment 352	Construc- tion, min- ing, and materials handling machinery 353	Metal- working machinery and equipment 354	Office, computing and ac- counting machines 357	Other machinery, except electrical 355-56, 358-59	Electric transmis- sion and distribu- tion equipment 361,3825	Electri- cal in- dustrial appa- ratus 362	Radio and television receiving sets, except communi- cation types 365	Communi- cations equipment 366	Elec- tronic components and accessories 367	Other electrical equipment and supplies 363-64, 368-69
Total.....		9718	9228	9423	9129	95,579	9313	9150	9382	9136	96,024	92,979	9621
Food, kindred, and tobacco products.....	20,21	(1)	(1)	(1)	(1)	(1)	(1)	0	(1)	(1)	(1)	(1)	(1)
Textiles and apparel.....	22,23	0	0	0	(1)	0	(1)	0	(1)	0	0	(1)	0
Lumber, wood products, and furniture.....	24,25	0	0	(1)	0	0	(1)	0	0	0	0	0	0
Paper and allied products.....	26	0	0	0	0	(1)	(1)	0	(1)	0	0	(1)	0
Chemicals and allied products.....	28	0	0	0	0	0	(1)	(1)	(1)	0	(1)	(1)	0
Industrial chemicals.....	281-82,286	0	0	0	0	0	(1)	0	(1)	0	0	(1)	0
Drugs and medicines.....	283	0	0	0	0	0	0	(1)	(1)	0	(1)	(1)	0
Other chemicals.....	284-85,287-89	0	0	0	0	0	0	0	0	0	0	(1)	0
Petroleum refining.....	29	(1)	0	(1)	(1)	(1)	(1)	0	(1)	0	0	(1)	0
Rubber products.....	30	0	0	(1)	0	(1)	0	0	0	0	(1)	(1)	(1)
Stone, clay, and glass products.....	32	0	0	(1)	0	0	(1)	0	(1)	0	(1)	(1)	0
Primary metals.....	33	1	0	(1)	16	(1)	(1)	4	(1)	0	0	13	(1)
Ferrous metals and products.....	331-32,3398-99	(1)	0	(1)	(1)	(1)	(1)	(1)	(1)	0	0	(1)	(1)
Nonferrous metals and products.....	333-36	(1)	0	(1)	(1)	0	(1)	(1)	0	0	0	(1)	(1)
Fabricated metal products.....	34	0	4	3	(1)	0	2	0	(1)	0	(1)	(1)	0
Machinery.....	35	275	(1)	387	83	(1)	73	0	(1)	0	(1)	321	267
Office, computing, and accounting machines.....	357	0	0	0	0	5,268	0	0	(1)	0	(1)	316	(1)
Other machinery, except electrical.....	351-56,358-59	275	(1)	387	83	(1)	73	0	(1)	0	3	5	(1)
Electrical equipment.....	36	(1)	(1)	(1)	(1)	202	24	74	114	101	3,592	1,832	168
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	0	72	5	(1)	(1)
Communication equipment.....	366	0	0	(1)	0	(1)	(1)	(1)	(1)	(1)	3,086	255	(1)
Electronic components.....	367	0	0	0	0	35	(1)	(1)	(1)	15	(1)	240	17
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)	(1)	15	66	101	(1)	(1)	(1)	143
Transportation equipment.....	37	(1)	11	12	(1)	(1)	(1)	45	(1)	(1)	(1)	524	128
Motor vehicles and motor vehicles equipment.....	371	331	8	(1)	(1)	(1)	(1)	10	(1)	(1)	(1)	(1)	(1)
Other transportation equipment.....	373-75,379	(1)	0	0	0	0	0	(1)	0	0	(1)	(1)	(1)
Aircraft and missiles.....	372,376	(1)	4	(1)	5	(1)	(1)	(1)	(1)	(1)	(1)	440	(1)
Professional and scientific instruments....	38	(1)	(2)	(1)	(1)	(1)	0	0	(1)	(1)	37	34	10
Scientific and mechanical measuring instruments.....	381-82	(1)	0	0	(1)	0	0	0	20	(1)	37	30	(1)
Optical, surgical, photographic, and other instruments.....	383-87	0	0	(1)	0	(1)	0	0	(1)	0	0	4	(1)
Other manufacturing industries.....	27,31,39	0	0	0	0	2	6	0	0	0	(1)	2	(1)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	43	0	(1)	(1)	(1)	18	25	(1)	0	426	57	(1)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Less than \$0.5 million

NOTE: Imputation of R&D expenditures by product field was eliminated in 1985. See Table B-35 for "coverage ratios."

SOURCE: National Science Foundation, SRS

Table B-36. Funds for applied research and development by industry and secondary product field: 1985 (continued)

DATA NOT COLLECTED FOR 1986		Transportation equipment			Professional and scientific instruments		
Industry	SIC Code	Motor vehicles and equipment 371	Other transportation equipment 379	Aircraft and parts 372	Guided missiles and space-craft 376	Scientific and mechanical measuring instruments 381-82	Optical, surgical, photographic and other instruments 383-87
Total.....		(1)	(1)	\$3,947	\$3,959	\$820	\$306
Food, kindred, and tobacco products.....	20,21	0	0	0	(1)	0	0
Textiles and apparel.....	22,23	(1)	0	(1)	0	0	0
Lumber, wood products, and furniture.....	24,25	0	0	0	0	0	(1)
Paper and allied products.....	26	(1)	0	0	0	(1)	0
Chemicals and allied products.....	28	0	(1)	(1)	3	174	133
Industrial chemicals.....	281-82,286	0	0	0	0	(1)	(1)
Drugs and medicines.....	283	0	(1)	(1)	3	(1)	(1)
Other chemicals.....	284-85,287-89	0	0	0	0	(1)	(1)
Petroleum refining.....	29	0	(1)	0	0	(1)	(1)
Rubber products.....	30	(1)	0	(1)	(1)	0	0
Stone, clay, and glass products.....	32	(1)	(1)	3	(1)	(1)	0
Primary metals.....	33	(1)	(1)	(1)	(1)	(1)	0
Ferrous metals and products.....	331-32,3398-99	(1)	(1)	(1)	(1)	0	0
Nonferrous metals and products.....	333-36	(1)	(1)	(1)	(1)	(1)	0
Fabricated metal products.....	34	(1)	(1)	(1)	(1)	8	0
Machinery.....	35	57	(1)	(1)	0	(1)	(1)
Office, computing, and accounting machines.....	357	0	0	0	0	18	0
Other machinery, except electrical.....	351-56,358-59	57	(1)	(1)	0	(1)	(1)
Electrical equipment.....	36	14	13	(1)	242	45	(1)
Radio and TV receiving equipment.....	365	0	0	0	(1)	0	0
Communication equipment.....	366	(1)	(1)	(1)	(1)	(1)	(1)
Electronic components.....	367	0	0	0	0	(1)	(1)
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)
Transportation equipment.....	37	(1)	128	2,664	(1)	29	(1)
Motor vehicles and motor vehicles equipment.....	371	(1)	(1)	(1)	(1)	(1)	0
Other transportation equipment.....	373-75,379	0	(1)	(1)	0	0	0
Aircraft and missiles.....	372,376	(1)	(1)	2,652	3,352	(1)	(1)
Professional and scientific instruments....	38	(1)	0	5	(1)	432	97
Scientific and mechanical measuring instruments.....	381-82	(1)	0	(1)	0	361	2
Optical, surgical, photographic, and other instruments.....	383-87	(1)	0	(1)	(1)	71	94
Other manufacturing industries.....	27,31,39	0	(1)	(1)	(1)	0	(1)
Nonmanufacturing industries.....	10-17,41-67,737,739,807,891	(1)	(1)	108	113	54	0

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Less than \$0.5 million.

NOTE: Imputation of R&D expenditures by product field was eliminated in 1985. See Table B-35 for "coverage ratios."

Table B-37. Expenditures for energy research and development
by industry: 1972 and 1974-87 (projected)

Industry	SIC code	[Dollars in millions]														Pro- jected 1987
		1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	
Total.....		\$750	\$1,399	\$1,774	\$2,073	\$2,573	\$2,965	\$3,643	\$4,162	\$4,216	\$4,287	\$4,396	\$4,528	\$4,047	\$3,458	\$3,524
Food, kindred, and tobacco products(4).....	20,21	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4	5	(1)	(1)	(3)	2	2	2
Textiles and apparel.....	22,23	0	0	0	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)	2	1	(2)	(2)
Lumber, wood products, and furniture.....	24,25	(1)	(1)	(1)	(1)	(1)	(1)	(1)	3	4	6	6	6	4	(3)	2
Paper and allied products.....	26	(1)	(1)	(1)	(1)	1	2	3	3	2	2	2	3	(2)	(2)	(3)
Chemicals and allied products.....	28	52	71	102	121	148	157	220	257	312	346	343	189	158	(3)	(3)
Industrial chemicals.....	281-82,286	47	69	100	(1)	(1)	(1)	(1)	246	305	336	332	178	(2)	(2)	(2)
Drugs and medicines.....	283	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Other chemicals.....	284-85,287-89	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	5	5	4
Petroleum refining.....	29	285	371	405	440	536	648	776	845	1,067	1,156	1,272	1,339	1,179	978	897
Rubber products.....	30	(1)	(1)	(1)	(1)	10	12	12	15	17	16	22	23	(2)	(2)	(2)
Stone, clay, and glass products.....	32	(1)	(1)	(1)	4	6	7	17	21	24	17	7	5	(2)	(2)	(2)
Primary metals.....	33	10	22	27	33	51	49	72	78	80	100	93	(3)	(3)	75	(2)
Ferrous metals and products.....	331-32,3398-99	(1)	(1)	(1)	12	19	14	19	20	20	22	36	37	28	(2)	21
Nonferrous metals and products.....	333-36	(1)	(1)	(1)	21	32	33	48	58	59	79	57	(3)	(3)	(2)	(2)
Fabricated metal products.....	34	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	60	38	(2)	12	(2)	(2)
Machinery.....	35	8	16	23	40	61	80	83	108	127	192	178	229	285	325	(3)
Office, computing, and accounting machines.....	357	(1)	(1)	(1)	(1)	(1)	(1)	13	17	6	20	(1)	(3)	30	39	40
Other machinery, except electrical.....	351-56,358-59	(1)	(1)	(1)	(1)	(1)	(1)	70	91	121	172	152	195	256	286	(3)
Electrical equipment.....	36	194	389	464	585	650	714	843	917	908	866	879	850	830	741	732
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	3	(1)	5	0	0	0	0	0
Communication equipment.....	366	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	161	153	(2)	117	111	107
Electronic components.....	367	(1)	(1)	(1)	(1)	5	5	13	12	15	18	17	(2)	(2)	(2)	(2)
Other electrical equipment.....	361-64,369	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	681	707	729	(2)	(2)	(2)
Transportation equipment.....	37											(2)	(3)	(3)	(3)	(3)
Motor vehicles and motor vehicles equipment.....	371	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Other transportation equipment.....	373-75,379	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	2	3	2	(2)	(2)	(2)
Aircraft and missiles.....	372,376	65	142	134	110	165	283	372	446	412	346	377	572	544	(2)	(2)
Professional and scientific instruments.....	38	12	14	14	10	17	27	28	45	53	75	86	97	(2)	(2)	(2)
Scientific and mechanical measuring instruments..	381-82	(1)	(1)	(1)	(1)	12	19	24	40	(1)	73	(1)	(2)	(2)	(2)	(2)
Optical, surgical, photographic, and other instruments.....	383-87	(1)	(1)	(1)	(1)	5	8	4	5	(1)	(1)	(1)	(2)	(2)	(2)	(2)
Other manufacturing industries.....	27,31,39	(1)	(1)	(1)	(1)	4	7	7	19	(1)	12	17	12	(2)	(2)	(2)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	76	100	98	137	185	220	324	333	374	385	366	455	370	367	439

(1) Not separately available but included in total. See general notes.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of 50 percent or more.

(4) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

SOURCE: National Science Foundation, SRS

Table B-38. Company funds for energy research and development
by selected industry: 1974-86

[Dollars in millions]

Industry	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$857	\$1,152	\$1,319	\$1,632	\$1,796	\$2,230	\$2,599	\$2,680	\$2,798	\$2,877	\$3,017	\$2,600	\$2,235
Chemicals and allied products.....	28	(1)	(1)	(1)	(1)	(1)	(1)	(1)	149	177	164	167	(2)	(2)
Petroleum refining.....	29	(1)	(1)	(1)	469	530	623	699	957	1,091	1,207	(2)	1,125	936
Machinery.....	35											(2)	(2)	(2)
Electrical equipment.....	36	96	115	122	165	137	219	205	203	171	180	196	133	120
Aircraft and missiles.....	372,376	(1)	(1)	(1)	57	68	113	163	124	88	(1)	133	164	130
All other manufacturing industries.....		(1)	(1)	(1)	(1)	(1)	(1)	(1)	1,053	1,102	(1)	831	664	553
Nonmanufacturing industries.....	7-17,41-67,737, 739,807,891	48	31	66	75	82	141	154	194	169	151	205	94	115

NOTE: Data not available for 1972.

(1) Not separately available but included in total. See general notes.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation, SRS

Table B-39. Federal funds for energy research and development
by selected industry: 1974-86

[Dollars in millions]

Industry	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$482	\$622	\$754	\$941	\$1,169	\$1,413	\$1,563	\$1,536	\$1,489	\$1,519	\$1,508	\$1,447	\$1,223
Chemicals and allied products.....	28	(1)	(1)	(1)	(1)	(1)	(1)	(1)	163	169	179	22	(3)	(3)
Petroleum refining.....	29	(2)	(2)	(2)	67	118	153	146	109	66	65	(3)	53	41
Machinery.....	35											(3)	(3)	(3)
Electrical equipment.....	36	293	349	463	485	577	624	711	705	694	699	654	697	622
Aircraft and missiles.....	372,376	(2)	(2)	(2)	108	215	259	283	288	258	(1)	439	380	(3)
All other manufacturing industries.....		(2)	(2)	(2)	(2)	(1)	(1)	(1)	91	87	(1)	60	16	5
Nonmanufacturing industries.....	07-17,41-67,737, 739,807,891	52	67	71	110	139	183	179	180	215	215	250	276	252

NOTE: Data not available for 1972.

(1) Not separately available but included in total. See general notes.

(2) Less than \$0.5 million.

(3) Data have been withheld to avoid disclosing operations of individual companies.

(4) Data have been withheld due to imputation of more than 50 percent.

SOURCE: National Science Foundation, SRS

Table B-40. Industrial expenditures for energy research and development
by primary energy source: 1973-87 (projected)

Primary energy source	[Dollars in millions]														Pro- jected 1987
	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	
Total.....	\$1,009	\$1,339	\$1,774	\$2,073	\$2,573	\$2,965	\$3,643	\$4,162	\$4,216	\$4,287	\$4,396	\$4,524	\$4,047	\$3,458	\$3,524
Fossil fuels.....	438	516	550	605	757	843	1,063	1,228	1,437	1,491	1,591	1,768	1,921	1,515	1,489
Oil.....	297	329	333	381	449	(1)	557	(1)	772	(1)	905	(1)	1,428	(1)	(1)
Gas.....	51	74	66	68	93	(1)	113	(1)	208	(1)	255	(1)	194	(1)	(1)
Shale.....	12	18	19	24	35	(1)	24	(1)	57	(1)	48	(1)	128	(1)	(1)
Coal.....	49	65	109	127	175	(1)	313	(1)	383	(1)	(3)	(1)	154	(1)	(1)
Synthetic fossil fuels.....	(1)	21	50	74	115	(1)	236	(1)	210	(1)	(3)	(1)	114	(1)	(1)
Mining.....	(1)	5	9	10	9	(1)	1	(1)	31	(1)	(3)	(1)	8	(1)	(1)
Other.....	(1)	39	50	43	51	(1)	76	(1)	142	(1)	(3)	(1)	32	(1)	(1)
Other fossil fuels	29	30	23	5	5	(1)	56	(1)	17	(1)	(3)	(1)	17	(1)	(1)
Nuclear.....	501	601	700	799	926	995	1,037	1,056	1,037	1,078	1,131	1,133	1,240	986	993
Fission.....	476	567	659	741	844	(1)	913	(1)	866	(1)	984	(1)	1,087	(1)	(1)
Fusion.....	25	34	41	58	82	(1)	124	(1)	171	(1)	147	(1)	153	(1)	(1)
Total geothermal, solar, conservation, and utilization....	3	146	460	584	775	(1)	1,156	(1)	774	(1)	1,441	1,239	482	523	596
Geothermal.....	1	2	6	13	24	(1)	149	(1)	71	(1)	(3)	(1)	55	(1)	(1)
Solar.....	2	7	19	43	64	(1)	321	(1)	298	(1)	(3)	(1)	98	(1)	(1)
Conservation and utilization.....	(1)	137	435	528	687	(1)	686	(1)	405	(1)	(3)	(1)	329	(1)	(1)
All other energy....	67	76	64	85	115	(1)	387	(1)	968	(1)	233	384	404	435	446

(1) Data not collected.

(2) Data have been withheld due to imputation of more than 50 percent

(3) Not separately available, but included in total. See general notes.

Note: Detailed data for 1977, 1979, 1981, and 1983 were estimated based upon (a) data actually reported in those years, (b) revised data for those years which were reported on the 1978, 1980, 1982, and 1984 survey forms, and (c) adjustments due to new sample in 1981.

SOURCE: National Science Foundation, SRS

Table B-41. Company funds for energy research and development
by primary energy source: 1974-87 (projected)

[Dollars in millions]

Primary energy source	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Pro- jected 1987
Total.....	9857	91,152	91,316	91,632	91,796	92,230	92,599	92,680	92,798	92,877	93,017	92,600	92,235	92,270
Fossil fuels.....	503	507	523	644	678	788	993	1,257	1,361	1,473	1,536	1,841	1,444	1,414
Oil.....	326	327	369	436	(1)	529	(1)	746	(1)	(4)	(1)	1,415	(1)	(1)
Gas.....	(4)	(4)	52	73	(1)	109	(1)	(4)	(1)	(4)	(1)	(2)	(1)	(1)
Shale.....	(4)	(4)	(4)	(4)	(1)	(4)	(1)	(4)	(1)	(4)	(1)	127	(1)	(1)
Coal.....	56	77	80	98	(1)	130	(1)	244	(1)	(4)	(1)	(3)	(1)	(1)
Synthetic fossil fuels...	(4)	(4)	48	64	(1)	84	(1)	132	(1)	(4)	(1)	93	(1)	(1)
Mining.....	(4)	(4)	7	5	(1)	1	(1)	24	(1)	(4)	(1)	8	(1)	(1)
Other.....	33	34	25	29	(1)	45	(1)	89	(1)	(4)	(1)	(3)	(1)	(1)
Other fossil fuels.....	(4)	(4)	(4)	(4)	(1)	(4)	(1)	(4)	(1)	(4)	(1)	17	(1)	(1)
Nuclear.....	157	160	198	217	217	169	150	126	99	91	103	154	98	89
Fission.....	146	156	194	211	(1)	167	(1)	70	(1)	72	(1)	139	(1)	(1)
Fusion.....	11	4	4	6	(1)	2	(1)	56	(1)	19	(1)	15	(1)	(1)
Total geothermal, solar, conservation, and utilization.....	(4)	(4)	533	387	(1)	1,054	(1)	573	(1)	1,161	1,106	321	398	464
Geothermal.....	(4)	(4)	5	9	(1)	122	(1)	40	(1)	(4)	(1)	28	(1)	(1)
Solar.....	(4)	(4)	17	22	(1)	251	(1)	199	(1)	(4)	(1)	52	(1)	(1)
Conservation and utilization.....	129	425	511	656	(1)	681	(1)	334	(1)	(4)	(1)	241	(1)	(1)
All other energy.....	62	46	62	83	(1)	219	(1)	724	(1)	152	272	284	296	304

(1) Data not collected.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of more than 50 percent.

(4) Not separately available but included in total. See general notes.

Note: Data for 1973-1976 were revised by the National Science Foundation. Detailed data for 1977, 1979, 1981, 1983, and 1985 were estimated based upon (a) data actually reported in those years, (b) revised data for those years which were reported on the 1978, 1980, 1982, and 1984 survey forms, and (c) adjustments due to new sample in 1981.

SOURCE: National Science Foundation, SRS

Table B-42. Federal funds for energy research and development
by primary energy source: 1974-87 (projected)

Primary energy source	[Dollars in millions]													Pro- jected
	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Total.....	\$482	\$622	\$757	\$941	\$1,169	\$1,413	\$1,563	\$1,536	\$1,489	\$1,519	\$1,507	\$1,447	\$1,223	\$1,254
Fossil fuels.....	13	43	82	113	165	275	235	180	130	118	232	80	71	75
Oil.....	3	6	12	13	(1)	29	(1)	26	(1)	(4)	(1)	13	(1)	(1)
Gas.....	(4)	(4)	16	20	(1)	4	(1)	(4)	(1)	10	(1)	(2)	(1)	(1)
Shale.....	(4)	(4)	(4)	(4)	(1)	(4)	(1)	(4)	(1)	1	(1)	1	(1)	(1)
Coal.....	9	32	47	77	(1)	183	(1)	139	(1)	77	(1)	(3)	(1)	(1)
Synthetic fossil fuels...	(4)	(4)	26	51	(1)	152	(1)	78	(1)	(4)	(1)	21	(1)	(1)
Mining.....	(4)	(4)	3	4	(1)	0	(1)	7	(1)	(4)	(1)	0	(1)	(1)
Other.....	6	16	18	22	(1)	31	(1)	53	(1)	(4)	(1)	(3)	(1)	(1)
Other fossil fuels.....	(4)	(4)	(4)	(4)	(1)	(4)	(1)	(4)	(1)	16	(1)	0	(1)	(1)
Nuclear.....	444	540	601	709	778	868	906	911	979	1,040	1,030	1,086	888	904
Fission.....	421	503	547	633	(1)	746	(1)	796	(1)	912	(1)	948	(1)	(1)
Fusion.....	23	37	54	76	(1)	122	(1)	115	(1)	128	(1)	138	(1)	(1)
Total geothermal, solar, conservation, and utilization.....	(4)	(4)	51	88	(1)	102	(1)	201	(1)	280	133	161	125	132
Geothermal.....	(4)	(4)	8	15	(1)	27	(1)	31	(1)	(4)	(1)	27	(1)	(1)
Solar.....	(4)	(4)	26	42	(1)	70	(1)	99	(1)	(4)	(1)	46	(1)	(1)
Conservation and utilization.....	8	10	17	31	(1)	5	(1)	71	(1)	80	(1)	88	(1)	(1)
All other energy.....	14	18	23	32	(1)	168	(1)	244	(1)	81	112	120	139	142

(1) Data not collected.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of more than 50 percent.

(4) Not separately available but included in total. See general notes.

Note: Data for 1973-1976 were revised by the National Science Foundation. Detailed data for 1977, 1979, 1981, 1983, and 1985 were estimated based upon (a) data actually reported in those years, (b) revised data for those years which were reported on the 1978, 1980, 1982, and 1984 survey forms, and (c) adjustments due to new sample in 1981.

Table B-43. Expenditures for pollution abatement research and development by industry: 1974-87 (projected)

[Dollars in millions]

Industry	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Projected 1987
Total.....		\$657	\$647	\$754	\$901	\$1,065	\$1,249	\$1,202	(1)	(1)	(1)	\$1,066	(4)	(4)	\$1,710
Food, kindred, and tobacco products(6).....	20,21	3	3	3	3	2	2	3	1	1	9	12	1	(5)	(3)
Textiles and apparel.....	22,23	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(4)	(5)	(3)	(3)
Lumber, wood products, and furniture.....	24,25	5	4	4	5	3	3	4	5	4	3	(3)	2	3	3
Paper and allied products.....	26	4	5	6	6	8	(2)	(2)	(2)	8	5	6	6	5	5
Chemicals and allied products.....	28	61	71	72	82	79	146	178	186	191	164	157	(4)	(4)	(4)
Industrial chemicals.....	281-82,286	39	56	58	64	67	128	157	165	172	142	138	(4)	(4)	(4)
Drugs and medicines.....	283	(2)	(2)	(2)	(2)	(2)	4	4	5	5	7	4	(3)	(3)	(3)
Other chemicals.....	0	(2)	(2)	(2)	(2)	(2)	13	16	15	14	16	15	25	29	33
Petroleum refining.....	29	61	65	58	60	71	80	95	92	97	82	89	61	64	(4)
Rubber products.....	30	0	2	2	2	3	3	3	(2)	2	1	(3)	(3)	(3)	(3)
Stone, clay, and glass products.....	32	7	5	4	6	7	9	11	9	7	9	(4)	3	4	5
Primary metals.....	33	13	24	31	29	25	29	30	24	22	21	21	20	7	7
Ferrous metals and products.....	331-32,3398-99	11	17	19	18	13	14	14	16	13	10	13	11	2	1
Nonferrous metals and products.....	333-36	3	7	12	12	12	15	15	9	9	11	8	9	6	6
Fabricated metal products.....	34	(2)	(2)	(2)	(2)	(2)	6	7	3	11	7	14	6	9	9
Machinery.....	35	25	23	29	32	38	31	30	34	30	29	30	27	42	56
Office, computing, and accounting machines	357	0	0	0	0	0	0	1	0	0	1	(3)	0	7	10
Other machinery, except electrical.....	351-56,358-59	25	23	29	31	37	30	29	34	30	28	(3)	27	35	46
Electrical equipment.....	36	16	19	18	20	19	34	39	39	31	29	(3)	(3)	(3)	(3)
Radio and TV receiving equipment.....	365	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communication equipment.....	366	(2)	(2)	5	6	6	5	6	(2)	(2)	(2)	(3)	1	1	1
Electronic components.....	367	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(4)	(5)	(3)	(3)
Other electrical equipment.....	361-64,369	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	23	(3)	(3)	(3)	(3)
Transportation equipment.....	37											(4)	(4)	(4)	(4)
Motor vehicles & motor vehicles equipment.	371	384	347	413	487	593	(2)	(2)	(2)	(2)	(2)	(3)	(3)	(3)	(3)
Other transportation equipment.....	373-75,379	(2)	(2)	(2)	(2)	(2)	0	(2)	0	0	(2)	(3)	(3)	(5)	(5)
Aircraft and missiles.....	372,376	38	36	48	57	64	64	38	30	(2)	(2)	(3)	(4)	(4)	(3)
Professional and scientific instruments.....	38	(2)	(2)	(2)	3	4	3	(2)	(2)	(2)	3	2	2	2	(3)
Scientific and mechanical measuring instruments.....	381-82	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1	(3)	(3)	(3)	(3)
Optical, surgical, photographic, and other instruments.....	383-87	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	2	(3)	(3)	(3)	(3)
Other manufacturing industries.....	27,31,39	2	1	2	3	3	2	3	(2)	(2)	2	3	(4)	(3)	(3)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	29	34	55	61	102	104	79	77	65	125	114	119	81	131

(1) Data not available due to high rate of imputation or because of disclosure policy.

(2) Not separately available but included in total. See general notes.

(3) Data have been withheld to avoid disclosing operations of individual companies.

(4) Data have been withheld due to imputation of more than 50 percent.

(5) Less than \$0.5 million.

(6) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

[Dollars in millions]

Industry	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$606	\$606	\$708	\$861	(1)	\$1,139	\$1,095	(2)	(2)	(2)	(5)	(5)	(5)
Chemicals and allied products.....	28	(3)	(3)	57	64	(1)	113	130	128	123	98	(4)	130	132
Petroleum refining.....	29	59	64	59	82	(1)	(3)	93	92	97	82	89	61	64
Machinery.....	35											(4)	(4)	(4)
Electrical equipment.....	36	(3)	(3)	11	11	(1)	17	19	19	19	24	(4)	(4)	(4)
Aircraft and missiles.....	372,376	13	29	37	49	(1)	(3)	26	20	22	17	24	(4)	(4)
All other manufacturing industries.....		(3)	(3)	494	573	(1)	(3)	705	(3)	(3)	(3)	565	(4)	(4)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	(3)	(3)	50	82	(1)	98	63	39	38	51	47	(4)	(4)

(1) Data not available for 1978.

(2) Data not available due to high rate of imputation or because of disclosure policy.

(3) Not separately available but included in total. See general notes.

(4) Data have been withheld to avoid disclosing operations of individual companies.

(5) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table D-45. Federal funds for pollution abatement research and development by selected industry: 1974-86

[Dollars in millions]

Industry	SIC code	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$51	\$41	\$51	\$57	(1)	\$98	\$107	\$129	\$122	\$176	\$169	\$169	\$148
Chemicals and allied products.....	28	(2)	(2)	15	20	(1)	36	48	58	68	66	(3)	(3)	(3)
Petroleum refining.....	29	2	1	4	6	(1)	(2)	2	0	0	0	(3)	0	0
Machinery.....	35											(3)	(3)	(3)
Electrical equipment.....	36	(2)	(2)	7	8	(1)	17	20	20	12	5	(3)	(3)	(3)
Aircraft and missiles.....	372,376	21	7	11	8	(1)	(2)	12	10	(2)	(2)	(3)	(3)	(3)
All other manufacturing industries.....		(2)	(2)	12	8	(1)	(2)	6	3	(2)	(2)	(3)	(3)	(3)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	(2)	(2)	2	7	(1)	15	16	38	26	74	67	(3)	(3)

(1) Data not available for 1978.

(2) Not separately available but included in total. See general notes.

(3) Data have been withheld to avoid disclosing information about individual companies.

(4) Data have been withheld due to imputation of 50 percent or more.

(5) Less than \$0.5 million.

Table B-46. Industrial expenditures for pollution abatement research and development by type of pollution: 1973-87 (projected)

Type of pollution	[Dollars in millions]														pro- jected
	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Total.....	\$603	\$657	\$647	\$754	\$901	\$1,065	\$1,249	\$1,202	(4)	(4)	(4)	\$1,066	(4)	(4)	\$1,710
Air.....	461	508	478	569	676	(3)	954	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(3)
Automotive emission.....	(3)	383	348	426	495	(3)	736	(3)	(4)	(3)	(4)	(3)	(1)	(3)	(3)
Electric power plant emissions.....	(3)	25	28	31	67	(3)	70	(3)	27	(3)	23	(3)	12	(3)	(3)
All other.....	(3)	100	102	112	114	(3)	148	(3)	112	(3)	91	(3)	(1)	(3)	(3)
Water.....	76	60	71	84	97	(3)	120	(3)	105	(3)	124	(3)	(4)	(3)	(3)
Solid waste.....	10	14	23	21	28	(3)	44	(3)	96	(3)	108	(3)	(4)	(3)	(3)
Other.....	56	75	75	80	100	(3)	131	(3)	65	(3)	54	(3)	108	(3)	(3)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Detailed data for 1977, 1979, and 1981 were estimated based upon (A) data actually reported in those years, (B) revised totals for those years which were reported on the 1978, 1980, and 1982 survey forms, and (C) adjustments due to new sample in 1981.

(3) Data not collected.

(4) Data have been withheld due to imputation of 50 percent or more.

Source: National Science Foundation, SRS

Table B-47. Industrial expenditures for pollution abatement research and development by type of pollution and source of funds: 1984-86

Type of pollution	[Dollars in millions]								
	1984			1985			1986		
	Total	Federal	Company	Total	Federal	Company	Total	Federal	Company
Total.....	\$1,066	\$169	(3)	(3)	\$169	(3)	(3)	\$148	(3)
Air.....	(2)	(2)	(2)	(3)	12	(3)	(2)	(2)	(2)
Automotive emission.....	(2)	(2)	(2)	(1)	(1)	(3)	(2)	(2)	(2)
Electric power plant emissions.....	(2)	(2)	(2)	12	5	7	(2)	(2)	(2)
All other.....	(2)	(2)	(2)	(1)	(1)	(3)	(2)	(2)	(2)
Water.....	(2)	(2)	(2)	(3)	15	(3)	(2)	(2)	(2)
Solid waste.....	(2)	(2)	(2)	(3)	117	(3)	(2)	(2)	(2)
Other.....	(2)	(2)	(2)	108	26	82	(2)	(2)	(2)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data not collected.

(3) Data have been withheld due to imputation of 50 percent or more.

Table B-42. Geographic distribution of funds for industrial research and development: 1963, 1966-77, 1979, 1981, 1982, and 1985

(Dollars in millions)

DATA NOT COLLECTED FOR 1966

Area	1963	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1981	1982	1985
United States.....	812,630	815,540	816,385	817,429	818,300	818,067	818,320	818,352	821,249	822,057	824,107	826,497	829,025	836,226	851,016	861,403	875,368
Northeast.....	3,018	5,092	5,438	5,867	6,095	6,333	6,510	6,869	6,725	7,291	7,405	8,096	8,687	10,296	14,171	18,737	27,058
New England.....	993	1,494	1,661	1,870	1,935	1,954	1,996	1,929	2,011	2,050	2,029	2,147	2,400	2,092	4,236	5,156	6,722
Maine.....	4	5	8	9	9	10	9	10	8	8	9	21	28	40	(1)	(1)	(5)
New Hampshire.....	6	27	49	43	49	49	52	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	294
Vermont.....	6	15	14	20	32	34	61	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(7)
Massachusetts.....	481	826	915	966	977	1,004	1,082	1,141	1,135	1,080	1,022	1,156	1,349	1,690	2,223	2,775	4,173
Rhode Island.....	7	9	14	17	45	52	51	43	44	41	45	22	24	49	90	169	199
Connecticut.....	409	612	663	795	726	705	629	637	732	821	832	815	876	985	1,571	1,864	1,976
Middle Atlantic.....	2,825	3,590	3,777	3,997	4,260	4,479	4,626	4,940	4,724	5,223	5,374	5,949	6,287	7,292	9,955	13,581	16,136
New York.....	1,176	1,573	1,718	1,830	1,901	2,020	2,066	2,201	1,971	2,134	2,225	2,418	2,542	2,959	3,490	4,966	7,019
New Jersey.....	950	1,119	1,090	1,117	1,202	1,291	1,403	1,550	1,467	1,512	1,547	1,717	1,990	2,191	3,254	4,655	5,547
Pennsylvania.....	691	906	911	1,050	1,077	1,149	1,157	1,181	1,347	1,537	1,602	1,814	1,845	2,143	3,111	4,060	3,570
North Central.....	2,791	3,382	3,630	3,766	4,216	4,293	4,409	5,414	5,468	5,756	5,821	6,574	7,777	10,013	11,761	14,495	18,001
East North Central.....	2,230	2,857	3,157	3,291	3,570	3,624	3,837	4,734	4,424	4,704	4,816	5,390	6,270	8,065	9,294	11,491	14,161
Ohio.....	583	774	879	910	925	902	945	904	1,043	1,103	1,139	1,183	1,323	1,635	1,581	2,544	2,947
Indiana.....	236	316	377	386	421	420	448	459	387	403	453	469	541	723	956	1,107	1,175
Illinois.....	390	539	612	625	640	731	796	855	862	970	1,042	1,226	1,360	1,673	2,073	2,689	3,231
Michigan.....	862	1,049	1,099	1,162	1,305	1,259	1,413	1,733	1,693	2,016	1,961	2,049	2,750	3,634	4,609	4,477	5,975
Wisconsin.....	149	179	201	208	229	224	275	283	249	212	221	263	296	420	655	664	676
West North Central.....	562	525	480	475	646	769	1,012	1,100	1,044	1,052	1,095	1,194	1,507	1,948	2,487	3,104	3,840
Minnesota.....	149	225	239	250	290	299	294	332	341	411	403	551	602	802	1,019	1,477	1,971
Iowa.....	50	103	75	71	87	130	138	156	150	175	182	144	173	150	334	322	317
Missouri.....	304	156	129	99	211	(1)	(1)	569	404	399	350	316	630	746	901	818	1,206
North Dakota.....	0	0	0	0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	10
South Dakota.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	7
Nebraska.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	11	7	10	9	13	14	15	(1)	24	42
Kansas.....	47	30	34	45	41	50	36	49	49	51	60	76	94	216	219	369	285
South.....	1,701	2,437	2,414	2,531	2,480	2,341	2,472	2,450	2,401	2,091	2,964	3,442	3,491	4,476	7,251	9,297	12,020
South Atlantic.....	931	1,179	1,220	1,304	1,464	1,424	1,612	1,546	1,666	1,775	1,720	1,847	2,012	2,592	3,933	4,726	6,812
Delaware.....	26	41	37	26	34	51	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3)
Maryland.....	241	275	254	310	301	361	369	386	423	481	446	451	382	424	525	547	1,437
District of Columbia.....	12	19	23	47	30	31	21	24	10	24	14	8	8	33	(1)	(1)	(5)
Virginia.....	93	(1)	(1)	(1)	(1)	(1)	133	131	194	244	236	264	318	464	525	845	806
West Virginia.....	89	59	63	61	54	48	40	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
North Carolina.....	71	124	120	138	157	175	140	143	203	227	235	263	327	500	754	797	
South Carolina.....	20	47	40	51	59	65	(1)	56	50	37	87	96	82	136	149	389	
Georgia.....	61	(1)	(1)	(1)	(1)	(1)	122	91	73	83	81	91	147	287	342	515	
Florida.....	204	338	375	436	424	371	422	353	386	374	340	396	462	620	1,404	1,547	1,832
East South Central.....	289	407	473	416	364	366	322	327	356	380	401	427	467	402	955	1,221	1,209
Kentucky.....	22	41	40	51	52	55	52	61	73	67	74	79	100	209	(1)	(1)	221
Tennessee.....	139	206	221	199	194	193	191	181	190	231	261	282	306	(1)	452	495	538
Alabama.....	116	230	203	164	114	105	96	81	94	79	57	56	48	62	144	299	387
Mississippi.....	2	2	2	2	3	3	3	4	8	8	10	10	13	(1)	(1)	(1)	62
West South Central.....	491	771	721	811	650	571	519	577	579	728	843	1,113	1,212	1,582	2,363	3,250	3,996
Arkansas.....	2	5	5	6	5	7	5	5	4	9	13	12	10	11	8	5	15
Louisiana.....	131	237	156	127	103	38	51	66	55	74	88	90	106	83	152	229	187
Oklahoma.....	53	99	83	71	73	81	63	82	72	76	99	116	142	174	243	337	304
Texas.....	304	430	479	657	477	445	400	424	448	567	643	897	954	1,233	1,940	2,771	3,492
West.....	4,320	4,635	4,897	5,264	5,504	5,060	4,489	4,019	5,275	5,620	6,165	6,655	7,379	10,176	15,124	18,887	23,730
Mountain.....	465	446	489	596	651	687	570	576	621	622	782	923	1,034	1,139	2,246	2,903	3,496
Montana.....	(1)	(1)	(1)	(1)	0	0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(4)
Idaho.....	27	(1)	(1)	(1)	(1)	(1)	30	(1)	(1)	(1)	(1)	(1)	(1)	(1)	244	302	419
Wyoming.....	1	2	2	2	3	3	5	(1)	(1)	(1)	(1)	(1)	(1)	(1)	4	2	7
Colorado.....	126	180	119	139	149	217	140	130	166	194	250	257	269	496	776	917	
New Mexico.....	(1)	146	154	151	179	179	(1)	162	149	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3)
Arizona.....	84	116	125	180	197	152	153	199	243	203	200	272	370	495	1,002		
Utah.....	71	10	21	21	25	22	17	26	43	61	91	112	132	142	(1)	247	317
Nevada.....	(1)	30	52	55	37	37	(1)	(1)	(1)	4	11	35	72	(1)	(1)	(1)	(3)
Pacific.....	3,854	4,189	4,407	4,668	4,850	4,313	3,919	4,243	4,654	4,950	5,304	5,732	6,345	9,037	12,878	15,984	20,242
Washington.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	404	499	610	681	(1)	(1)	1,413	2,182
Oregon.....	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	50	51	57	79	116	(1)	(1)	285
California.....	3,512	(1)	(1)	(1)	(1)	3,800	3,468	3,710	4,441	4,423	4,934	5,767	5,600	7,417	16,165	14,237	17,760
Alaska.....	0	0	0	0	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(3)
Hawaii.....	(1)	(1)	(1)	(1)	(1)	(1)	7	2	2	1	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed funds.....	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	1,140	1,702	1,801	2,030	2,296	3,145	3,461	3,917	4,451

(1) Not separately available; not included on total. (See general notes.)

(2) For 1962-72 funds were allocated to individual States based on each one's share of total research and development and are included in regional and U.S. totals.

(3) Data have been withheld to avoid disclosing information about individual companies.

(4) Data have been withheld due to imputation of 50 percent or more.

Source: National Science Foundation, RPS

Table B-49. Geographic distribution of funds for industrial research and development by source of funds: 1985

Area	Total	Federal	Company
United States.....	\$78,268	\$26,830	\$51,439
Northeast.....	23,058	6,064	16,994
New England.....	6,922	2,373	4,549
Maine.....	(1)	(1)	23
New Hampshire.....	294	(1)	(1)
Vermont.....	(1)	(1)	(1)
Massachusetts.....	4,173	1,556	2,617
Rhode Island.....	198	(1)	(1)
Connecticut.....	1,976	520	1,456
Middle Atlantic.....	16,136	3,691	12,445
New York.....	7,019	1,913	5,106
New Jersey.....	5,347	727	4,620
Pennsylvania.....	3,570	1,051	2,519
North Central.....	18,001	1,959	16,042
East North Central.....	14,161	1,081	13,080
Ohio.....	2,847	484	2,363
Indiana.....	1,433	(1)	(1)
Illinois.....	3,231	287	2,944
Michigan.....	5,975	85	5,890
Wisconsin.....	676	(1)	(1)
West North Central.....	3,840	878	2,962
Minnesota.....	1,971	(1)	(1)
Iowa.....	317	(1)	(1)
Missouri.....	1,206	(1)	(1)
North Dakota.....	10	1	9
South Dakota.....	7	0	7
Nebraska.....	42	(1)	(1)
Kansas.....	285	(1)	(1)
South.....	12,020	4,205	7,815
South Atlantic.....	6,812	2,327	4,485
Delaware.....	(1)	(3)	(1)
Maryland.....	1,437	813	624
District of Columbia.....	(1)	(1)	(1)
Virginia.....	800	459	341
West Virginia.....	(2)	(2)	94
North Carolina.....	797	1	796
South Carolina.....	389	(1)	(1)
Georgia.....	515	(1)	(1)
Florida.....	1,832	820	1,012
East South Central.....	1,209	621	588
Kentucky.....	221	0	221
Tennessee.....	538	(1)	(1)
Alabama.....	387	253	134
Mississippi.....	62	(1)	(1)
West South Central.....	3,998	1,257	2,741
Arkansas.....	15	0	15
Louisiana.....	187	(1)	(1)
Oklahoma.....	304	(1)	(1)
Texas.....	3,492	1,209	2,283
West.....	23,738	13,737	10,001
Mountain.....	3,496	1,626	1,870
Montana.....	(2)	(1)	(1)
Idaho.....	419	(1)	(1)
Wyoming.....	3	0	3
Colorado.....	917	150	767
New Mexico.....	(1)	(1)	38
Arizona.....	1,002	210	784
Utah.....	317	(1)	(1)
Nevada.....	(1)	(1)	28
Pacific.....	20,242	12,111	8,131
Washington.....	2,183	1,282	901
Oregon.....	285	(1)	(1)
California.....	17,760	10,816	6,944
Alaska.....	(1)	(1)	(1)
Hawaii.....	(1)	(1)	(1)
Undistributed funds.....	1,451	865	587

(1) Data have been withheld to avoid disclosing operations of individual companies.

Source: National Science Foundation, SRS

Table B-50. Distribution of R&D costs by industry and type of cost: 1985

DATA NOT COLLECTED FOR 1986

Industry	SIC Code	Wages of R & D personnel	Materials and supplies	Overhead costs
[Percent of Total R&D Funds]				
Total.....		43.0	20.0	37.0
Food, kindred, and tobacco products.....	20,21	52.7	13.9	33.4
Textiles and apparel.....	22,23	49.7	26.5	23.8
Lumber, wood products, and furniture.....	24,25	57.6	14.0	27.9
Paper and allied products.....	26	50.9	21.6	27.5
Chemicals and allied products.....	28	46.6	10.8	42.6
Industrial chemicals.....	281-82,286	45.2	9.3	45.5
Drugs and medicines.....	283	47.2	12.3	40.4
Other chemicals.....	284-85,287-89	49.3	11.3	39.4
Petroleum refining.....	29	39.4	12.0	48.6
Rubber products.....	30	42.6	23.4	34.1
Stone, clay, and glass products.....	32	44.6	14.9	40.5
Primary metals.....	33	41.2	12.2	46.6
Ferrous metals and products.....	331-32,3398-99	39.7	11.4	48.9
Nonferrous metals and products.....	333-36	44.2	13.8	42.1
Fabricated metal products.....	34	58.0	12.2	29.8
Machinery.....	35	40.2	16.8	43.1
Office, computing, and accounting machines.....	357	37.0	16.2	46.8
Other machinery, except electrical.....	351-56,358-59	51.7	18.7	29.6
Electrical equipment.....	36	38.4	23.3	38.3
Radio and TV receiving equipment.....	365	34.8	32.4	32.8
Communication equipment.....	366	33.8	22.9	43.4
Electronic components.....	367	47.9	13.9	38.2
Other electrical equipment.....	361-64,369	42.8	28.3	29.0
Transportation equipment.....	37	40.3	(1)	(1)
Motor vehicles and motor vehicles equipment.....	371	40.1	29.7	30.3
Other transportation equipment.....	373-75,379	51.9	(1)	(1)
Aircraft and missiles.....	372,376	40.2	24.9	34.9
Professional and scientific instruments....	38	59.8	15.7	24.5
Scientific and mechanical measuring instruments.....	381-82	52.9	15.5	31.6
Optical, surgical, photographic, and other instruments.....	383-87	66.2	15.8	18.0
Other manufacturing industries.....	27,31,39	54.8	12.5	32.7
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	53.2	8.9	37.9

(1) Data have been withheld to avoid disclosing operations of individual companies.

Source: National Science Foundation, SRS

Table D-51. Full-time-equivalent number of R&D scientists and engineers
by industry and size of company: 1957-58, 1963-64, 1967-68, and 1974-87

		[In thousands]																			
		January																			
Industry and size of company	SIC code	1957	1958	1963	1964	1967	1968	1974	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	
Total (January).....		229.4	234.8	327.3	340.2	367.2	376.7	360.0	364.4	382.8	404.4	423.9	450.6	487.8	509.8	522.1	544.5	560.2	583.1	584.5	
Total (Annual Average).....		232.1	256.1	333.8	341.9	372.0	381.9	361.7	373.6	393.6	414.2	437.3	469.2	498.8	516.0	533.3	552.4	571.7	583.8	NA	
Distribution by industry																					
Food, kindred, and tobacco products(7).....	20,21	3.8	4.8	5.1	5.7	6.1	6.3	6.4	6.9	6.9	6.9	7.4	7.2	7.4	7.4	7.8	7.6	(3)	(3)	(3)	
Textiles and apparel.....	22,23	0.7	0.8	1.0	1.2	1.9	2.5	1.8	1.8	1.7	1.8	1.8	(1)	2.0	1.9	2.0	2.2	1.9	1.9	1.7	
Lumber, wood products, and furniture.....	24,25	0.8	0.8	0.5	0.5	0.5	0.5	2.1	2.1	2.1	2.0	1.8	1.7	1.6	(1)	1.8	(1)	(3)	(3)	(3)	
Paper and allied products.....	26	1.5	1.7	2.5	3.8	4.7	4.8	4.9	5.2	6.3	6.5	7.1	7.4	8.0	8.4	8.3	7.9	8.7	9.2	9.2	
Chemicals and allied products.....	28	29.4	31.0	38.3	35.8	36.9	38.9	41.8	44.4	46.4	48.3	50.0	51.4	54.7	61.6	66.0	67.1	67.0	70.0	66.1	
Industrial chemicals.....	281-82,286	18.0	18.8	22.9	22.2	21.7	22.3	19.1	20.1	20.6	21.3	21.4	20.9	21.6	25.9	27.2	26.7	25.0	27.1	27.1	
Drugs and medicines.....	283	4.7	5.1	6.9	6.9	8.7	9.8	14.0	16.6	17.8	19.5	20.8	21.6	23.3	25.6	28.2	(1)	30.7	31.6	29.0	
Other chemicals.....	284-85,287-89	6.7	7.1	8.5	6.7	6.5	6.8	8.7	7.8	8.0	7.5	7.8	8.9	9.8	10.1	10.6	10.3	11.3	11.3	10.1	
Petroleum refining.....	29	6.9	7.4	8.9	8.1	8.7	9.2	9.2	8.6	8.9	9.9	10.1	10.8	13.0	15.6	14.7	13.2	13.4	10.3	8.5	
Rubber products.....	30	4.7	4.7	5.8	6.0	5.8	6.1	7.7	8.6	9.1	7.9	8.1	(1)	10.3	8.1	(1)	(1)	(3)	(3)	(3)	
Stone, clay, and glass products.....	32	(2)	(2)	3.8	3.3	3.3	4.1	4.5	4.6	4.5	5.1	5.2	5.4	5.6	5.1	5.0	4.6	4.9	5.1	5.3	
Primary metals.....	33	5.1	5.2	5.2	5.1	5.9	5.9	6.4	8.1	8.4	8.1	7.9	8.1	7.9	8.4	8.4	8.5	9.5	12.8	14.2	
Ferrous metals and products.....	331-32,338-99	2.9	3.0	2.9	2.8	3.3	3.1	3.3	3.9	3.9	4.2	4.3	4.7	4.8	5.2	5.3	5.2	6.4	9.3	10.6	
Nonferrous metals and products.....	333-34	2.2	2.2	2.3	2.3	2.5	2.7	3.1	4.2	4.5	3.9	3.6	3.4	3.1	3.2	3.1	3.3	3.1	3.5	3.6	
Fabricated metal products.....	34	8.4	8.3	6.8	7.0	6.3	5.6	7.3	6.8	7.1	7.0	6.8	7.8	7.8	8.2	(1)	12.9	(3)	(3)	(3)	
Machinery.....	35	24.9	27.4	31.4	27.3	33.6	37.4	51.0	55.7	55.3	57.8	60.2	62.1	69.2	76.0	76.3	75.0	77.3	81.8	78.0	
Office, computing, and accounting machines.....	357	(4)	(4)	(4)	(4)	(4)	(4)	34.5	38.1	37.7	38.9	40.9	41.8	43.7	48.1	49.6	50.3	52.0	57.1	55.3	
Other machinery, except electrical.....	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	18.9	19.3	20.3	25.5	27.9	26.7	24.7	25.3	24.6	22.7	
Electrical equipment.....	36	42.9	47.9	85.8	89.5	98.6	98.4	82.6	80.3	84.1	84.4	85.0	94.5	106.9	109.8	110.3	116.1	115.3	119.4	129.5	
Radio and TV receiving equipment.....	365	(6)	(6)	(6)	(6)	0.9	1.0	1.3	1.1	0.9	1.5	2.1	4.0	7.9	7.8	(1)	(1)	(3)	3.1	2.7	
Communication equipment.....	366							42.0	37.4	38.0	39.0	40.4	42.4	44.2	45.9	47.3	56.1	56.9	57.6	63.2	
Electronic components.....	367	19.2	22.3	55.1	60.4	66.7	67.4														
Other electrical equipment.....	361-64,369	23.7	25.6	30.7	29.1	31.0	30.0	29.7	31.6	32.2	29.7	28.5	30.0	32.0	31.7	(1)	27.9	30.3	31.9	38.9	
Transportation equipment.....	37																	135.5	143.5	146.3	
Motor vehicles and motor vehicles equipment.....	371							27.4	25.4	28.2	31.9	35.2	38.2	35.1	30.0	29.0	28.6	28.7	33.9	50.6	
Other transportation equipment.....	373-75,379							1.8	1.7	1.9	1.9	2.0	1.5	1.4	1.2	1.9	(1)	(3)	(3)	(3)	
Aircraft and missiles.....	372,376	58.7	58.6	90.7	101.1	100.4	101.1	70.6	66.9	72.0	82.0	86.5	85.9	95.2	91.1	95.5	96.5	103.8	107.2	93.3	
Professional and scientific instruments.....	38	10.2	11.0	9.4	10.8	13.0	14.1	17.5	18.8	20.5	23.3	27.0	32.8	34.7	42.7	(1)	(1)	(3)	(3)	(3)	
Scientific and mechanical measuring instruments....	381-82	5.8	6.5	3.9	3.8	3.6	3.8	5.6	6.7	7.2	9.0	11.7	(1)	18.6	(1)	(1)	(1)	(3)	(3)	(3)	
Optical, surgical, photographic, and other instruments.....	383-87	4.4	4.5	5.5	7.0	9.4	10.3	11.9	12.1	13.3	14.3	15.3	16.3	11.0	16.1	(1)	(1)	16.0	19.3	18.6	
Other manufacturing industries.....	27,31,39			2.8	2.0	2.2	2.4	3.7	4.2	4.5	4.6	4.7	4.6	4.8	5.5	6.1	(1)	(3)	(3)	(3)	
Nonmanufacturing industries.....	10-17,41-47,737,739,807,891	37.8	19.2		8.2	9.8	14.1	15.1	14.4	14.6	15.3	15.0	17.1	19.8	22.2	27.1	26.2	34.9	39.3	37.1	36.7
Distribution by size of company (based on number of employees)																					
Less than 500.....		44.8	48.8	34.1	32.5	27.4	27.2	28.0	30.2	31.1	29.5	30.5	34.4	38.0	40.7	42.6	53.2	41.0	(3)	35.6	
500 to 999.....																		10.3	(3)	9.8	
1,000 to 4,999.....		22.4	24.0	35.0	34.5	30.5	29.9	28.8	29.3	28.9	27.5	30.9	34.8	38.9	42.8	44.6	44.8	48.3	48.3	49.2	
5,000 to 9,999.....						24.0	24.6	26.4	26.1	28.6	28.7	30.7	29.6	27.2	36.6	29.5	29.7	27.9	37.7	37.1	
10,000 to 24,999.....		162.2	171.0	258.2	273.2			45.9	50.6	49.3	52.1	55.6	64.4	71.8	77.0	83.6	82.6	87.8	85.3	79.1	
25,000 or more.....						285.3	295.0														
								230.9	228.2	244.9	266.6	276.2	287.4	311.8	312.7	321.7	334.2	344.8	364.0	371.7	

(1) Not separately available but included in total. See general notes.

(2) Data included in the other manufacturing industries group.

(3) Data have been withheld due to imputation of 50 percent or more.

(4) Data not tabulated at this level prior to the 1972 survey.

(5) Data not tabulated at this level prior to the 1977 survey.

(6) Included in the other electrical equipment group.

(7) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."

NA Not available

Table B-52. Full-time equivalent number of R&D scientists and engineers by industry and source of R&D funds: January 1986

DATA NOT COLLECTED FOR JANUARY, 1987

Industry	SIC Code	Total	Federal	Company
Total.....		583,100	174,500	408,600
Food, kindred, and tobacco products.....	20,21	(2)	(1)	(1)
Textiles and apparel.....	22,23	1,900	(1)	(1)
Lumber, wood products, and furniture.....	24,25	(2)	0	(2)
Paper and allied products.....	26	9,200	(1)	(1)
Chemicals and allied products.....	28	70,000	(2)	(2)
Industrial chemicals.....	281-82,286	27,100	(2)	(2)
Drugs and medicines.....	283	31,600	(2)	(2)
Other chemicals.....	284-85,287-89	11,300	300	11,000
Petroleum refining.....	29	10,300	(1)	(1)
Rubber products.....	30	(2)	(2)	(2)
Stone, clay, and glass products.....	32	5,100	(1)	(1)
Primary metals.....	33	12,900	(1)	(1)
Ferrous metals and products.....	331-32,3398-99	9,300	(1)	(1)
Nonferrous metals and products.....	333-36	3,500	(2)	(2)
Fabricated metal products.....	34	(2)	(2)	(2)
Machinery.....	35	81,800	8,100	73,700
Office, computing, and accounting machines.....	357	57,100	(1)	(1)
Other machinery, except electrical.....	351-56,358-59	24,600	(1)	(1)
Electrical equipment.....	36	119,400	41,200	78,200
Radio and TV receiving equipment.....	365	3,100	(1)	(1)
Communication equipment.....	366	57,600	22,400	35,200
Electronic components.....	367	(2)	(2)	(2)
Other electrical equipment.....	361-64,369	31,900	(1)	(1)
Transportation equipment.....	37	143,500	(1)	(1)
Motor vehicles and motor vehicles equipment.....	371	33,900	(2)	27,600
Other transportation equipment.....	373-75,379	(2)	(1)	(1)
Aircraft and missiles.....	372,376	107,200	(2)	30,900
Professional and scientific instruments....	38	(2)	(2)	(2)
Scientific and mechanical measuring instruments.....	381-82	(2)	(1)	(1)
Optical, surgical, photographic, and other instruments.....	383-87	18,300	(1)	(1)
Other manufacturing industries.....	27,31,39	(2)	(2)	(2)
Nonmanufacturing industries.....	10-17,41-67,737,739,807,891	37,100	(2)	(2)

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

Source: National Science Foundation, SRS

Table B-53. Cost per R&D scientist or engineer by industry and size of company: 1957-58, 1963, 1967, 1972, and 1976-86

Industry and size of company	SIC code	1957	1958	1963	1967	1972	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total.....		\$32,700	\$32,800	\$37,800	\$44,100	\$55,700	\$72,200	\$75,800	\$80,400	\$87,400	\$94,900	\$103,900	\$112,400	\$118,900	\$129,800	\$137,000	138,100
Distribution by industry																	
Food, kindred, and tobacco products(7).....	20,21	17,200	16,800	25,200	29,500	39,500	51,400	60,100	66,000	72,300	84,900	(1)	(1)	(1)	(7)	(3)	(3)
Textiles and apparel.....	22,23	20,000	20,900	26,400	25,900	32,100	46,900	47,400	49,400	53,200	57,500	(1)	(1)	(1)	(3)	(3)	(3)
Lumber, wood products, and furniture.....	24,25	17,500	13,300	22,000	24,000	33,700	51,000	60,000	66,300	79,400	89,700	(1)	(1)	(1)	87,800	80,800	(3)
Paper and allied products.....	26	21,900	22,700	27,000	26,900	38,600	54,400	52,000	56,900	61,400	64,300	(1)	75,000	(1)	(3)	(3)	(3)
Chemicals and allied products.....	28	23,300	24,600	32,600	39,800	47,100	66,500	67,600	72,800	79,600	87,400	96,600	104,400	109,600	119,200	126,900	132,500
Industrial chemicals.....	281-82,286	27,400	28,400	34,800	43,900	54,000	74,700	79,600	84,200	92,800	103,400	118,000	124,300	126,600	135,200	149,700	149,600
Drugs and medicines.....	283	21,200	23,300	30,200	37,100	46,500	63,400	59,900	64,800	71,400	79,200	(1)	(1)	100,700	(3)	114,900	(3)
Other chemicals.....	284-85,287-89	14,200	15,300	27,900	29,800	33,400	50,800	53,800	61,600	66,500	66,500	(1)	(1)	(1)	(3)	107,100	(3)
Petroleum refining.....	29	29,500	32,600	35,400	41,500	57,100	87,200	97,700	106,000	120,800	130,400	(1)	(1)	(1)	(3)	(3)	(3)
Rubber products.....	30	22,800	18,700	26,500	30,600	53,100	56,700	57,800	61,600	(1)	(1)	(1)	(1)	72,200	(3)	(3)	84,200
Stone, clay, and glass products.....	32	(2)	(2)	26,000	36,800	43,600	57,800	59,800	62,900	67,200	73,800	(1)	(1)	(1)	(3)	(3)	(3)
Primary metals.....	33	21,000	24,000	35,700	41,000	44,700	61,300	65,200	70,000	79,300	91,000	107,700	119,000	132,900	(3)	(3)	(3)
Ferrous metals and products.....	331-32,3398-99	21,700	24,600	37,400	42,200	44,200	65,600	70,100	73,900	83,300	93,700	(1)	(1)	(1)	(3)	(3)	(3)
Nonferrous metals and products.....	333-36	20,000	23,200	33,500	41,200	44,800	57,500	60,500	65,600	74,000	87,700	(1)	(1)	(1)	119,100	129,200	127,700
Fabricated metal products.....	34	16,200	18,800	22,200	27,400	37,800	51,500	54,800	55,700	62,300	70,500	78,000	(1)	(1)	91,200	86,300	93,700
Machinery.....	35	25,600	27,500	31,000	37,400	48,000	62,800	68,600	72,600	78,900	89,900	93,900	102,900	110,900	126,400	136,500	133,900
Office, computing, and accounting machines.....	357	(4)	(4)	(4)	(4)	48,500	63,400	69,300	72,300	77,700	92,700	(1)	(1)	(1)	(3)	(3)	(3)
Other machinery, except electrical.....	351-56,358-59	(5)	(5)	(5)	(5)	(5)	(5)	(1)	73,300	81,400	84,700	(1)	(1)	(1)	(3)	(3)	(3)
Electrical equipment.....	36	39,700	38,200	33,000	39,300	55,400	68,600	69,900	76,800	87,200	91,100	95,300	105,800	123,200	134,900	145,300	144,900
Radio and TV receiving equipment.....	365	(6)	(6)	(6)	47,400	26,700	52,000	96,000	72,200	80,300	93,400	(1)	(1)	90,300	(3)	(3)	(3)
Communication equipment.....	366					57,800	66,100	70,800	75,500	87,800	92,900	105,500	123,400	137,600	152,000	154,000	148,400
Electronic components.....	367		36,000	34,600	31,700	36,200											
Other electrical equipment.....	361-64,369	42,800	41,900	35,400	45,800	59,700	74,700	74,200	85,100	94,900	98,300	(1)	(1)	(1)	(3)	(3)	(3)
Transportation equipment.....	37														(3)	(3)	182,000
Motor vehicles and motor vehicles equipment.....	371					68,100	103,700	111,700	115,600	122,900	135,200	147,400	162,900	185,300	211,600	224,700	(3)
Other transportation equipment.....	373-75,379	49,400	53,800	49,400	54,700	32,900	52,200	63,200	67,200	90,900	111,700	(1)	(1)	115,600	(3)	(3)	(3)
Aircraft and missiles.....	372,376	43,900	41,900	49,600	56,300	69,200	91,300	91,300	89,400	93,300	101,600	128,400	146,400	144,300	158,500	169,800	162,000
Professional and scientific instruments.....	38	23,500	25,600	29,900	40,000	53,200	66,700	71,700	79,400	83,800	89,700	93,400	(1)	(1)	104,900	105,600	104,100
Scientific and mechanical measuring instruments..	381-82	22,600	23,100	18,400	28,100	32,600	46,800	55,800	64,700	(1)	(1)	(1)	(1)	75,700	(3)	(3)	(3)
Optical, surgical, photographic, and other instruments.....	383-87	24,700	29,100	37,500	44,500	62,800	77,900	81,100	89,700	98,400	103,800	(1)	(1)	145,200	(3)	(3)	(3)
Other manufacturing industries.....	27,31,39	(1)	(1)	23,700	39,100	40,600	51,700	53,400	57,200	61,900	77,400	(1)	(1)	85,800	(3)	(3)	(3)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	(1)	(1)	31,000	38,300	45,600	56,500	63,200	76,600	83,500	86,400	77,200	75,200	71,700	75,100	76,700	73,600
Distribution by size of company (based on number of employees)																	
Less than 500.....		11,600	12,000	18,600	25,200	32,400	45,200	44,700	47,900	53,500	56,300	56,600	60,600	62,500	65,000	(8)	51,600
500 to 999.....															93,300	(8)	(8)
1,000 to 4,999.....		27,200	25,100	29,400	33,700	40,600	51,600	54,100	66,100	70,200	68,600	77,000	82,400	79,800	92,600	94,100	101,800
5,000 to 9,999.....					36,700	38,800	60,300	61,600	52,200	56,100	71,400	93,700	83,400	96,200	122,000	121,900	112,000
10,000 to 24,999.....		39,400	38,700	41,400		48,700	57,500	63,500	79,400	84,100	86,200	90,900	97,300	108,500	123,000	119,400	122,500
25,000 or more.....					45,000	63,600	82,700	80,000	88,800	96,200	105,800	117,200	130,300	137,200	145,700	157,500	157,100

Note: The full-time equivalent number of R&D scientists and engineers is derived by using the arithmetic mean of the full-time equivalent of R&D scientists and engineers employed in the Januaries of two consecutive years.

- (1) Not separately available but included in total. See general notes.
- (2) Included in the other manufacturing group.
- (3) Data have been withheld to avoid disclosing operations of individual companies.
- (4) Data not tabulated at this level prior to 1972.
- (5) Data not tabulated at this level prior to 1977.
- (6) Included in the other electrical equipment group.
- (7) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."
- (8) Data have been withheld due to imputation of 50 percent or more.

Table B-54. Cost per R&D scientist or engineer(1) by industry
and size of company: 1986

Industry	SIC code	Companies with total employment of--						
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total.....		\$138,100	\$51,600	(3)	\$101,800	\$112,000	\$122,500	\$157,100
Food, kindred, and tobacco products.....	20,21	(2)	5,500	(2)	108,500	139,900	(2)	(3)
Textiles and apparel.....	22,23	(2)	(2)	(2)	(2)	(3)	(3)	(2)
Lumber, wood products, and furniture.....	24,25	(2)	32,000	(3)	120,500	89,800	76,800	(2)
Paper and allied products.....	26	(2)	70,900	(2)	91,200	(2)	103,700	(2)
Chemicals and allied products.....	28	132,500	(2)	(2)	(2)	(2)	142,400	148,000
Industrial chemicals.....	281-82,286	149,600	50,100	(2)	(2)	(2)	(2)	(2)
Drugs and medicines.....	283	(2)	17,400	211,300	(2)	(2)	(2)	(2)
Other chemicals.....	284-85,287-89	(2)	(2)	(3)	102,800	(2)	(2)	(2)
Petroleum refining.....	29	(2)	42,800	(2)	(2)	(2)	(2)	(2)
Rubber products.....	30	(3)	(2)	(3)	(2)	(2)	(2)	(2)
Stone, clay, and glass products.....	32	(2)	(2)	(3)	(2)	(2)	(2)	(2)
Primary metals.....	33	(2)	50,100	(2)	(2)	(2)	(2)	(2)
Ferrous metals and products.....	331-32,3398-99	(2)	38,200	(2)	(2)	(2)	(2)	(2)
Nonferrous metals and products.....	333-36	127,700	64,900	412,500	(2)	(2)	(2)	(2)
Fabricated metal products.....	34	(3)	(2)	(2)	(2)	(3)	(2)	(2)
Machinery.....	35	133,900	(2)	(2)	98,800	(2)	(2)	161,900
Office, computing, and accounting machines.....	357	(2)	(2)	(2)	(2)	93,300	114,800	(2)
Other machinery, except electrical.....	351-56,358-59	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Electrical equipment.....	36	144,900	56,500	(3)	(2)	(2)	142,800	152,900
Radio and TV receiving equipment.....	365	(2)	(3)	(2)	70,700	(2)	(2)	0
Communication equipment.....	366	148,400	58,200	(2)	102,100	(2)	(2)	144,300
Electronic components.....	367	(3)	(2)	(2)	94,600	(2)	(2)	(2)
Other electrical equipment.....	361-64,369	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Transportation equipment.....	37	182,000	26,200	(2)	148,700	(2)	(2)	190,700
Motor vehicles and motor vehicles equipment.....	371	(2)	134,600	(2)	86,200	(2)	(2)	(2)
Other transportation equipment.....	373-75,379	(2)	39,900	(2)	93,600	(2)	(2)	(2)
Aircraft and missiles.....	372,376	162,000	26,000	(2)	219,500	(2)	(2)	170,400
Professional and scientific instruments.....	38	(3)	72,500	(2)	96,300	(2)	(2)	(2)
Scientific and mechanical measuring instruments..	381-82	(2)	(2)	67,100	(2)	(2)	(2)	(2)
Optical, surgical, photographic, and other instruments.....	383-87	(2)	(2)	(2)	(2)	(2)	(2)	(3)
Other manufacturing industries.....	27,31,39	(2)	(2)	(2)	(2)	(2)	(2)	(3)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	73,600	64,800	(3)	86,500	(2)	117,700	(2)

(1) See note on table B-53.

(2) Data have been withheld to avoid disclosing operations of individual companies.

(3) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-55. Cost per R&D scientist or engineer(1) in companies ranked by size of R&D program: 1972 and 1974-86

Companies ranked by size of R&D program (based on total R&D funds)	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
First 4.....	\$64,300	\$80,700	\$90,500	\$102,500	\$103,200	\$109,400	\$121,700	\$126,700	\$160,200	\$182,800	\$185,200	\$202,000	\$225,800	\$246,300
Next 4.....	76,300	80,500	84,000	87,600	94,600	103,800	105,700	119,200	138,900	127,600	154,000	167,000	176,200	183,500
Next 12.....	63,100	76,900	80,600	82,900	79,300	83,800	90,500	93,300	107,000	127,500	119,300	127,800	132,500	135,300
Next 20.....	57,500	62,200	66,400	68,200	75,900	80,800	87,600	97,400	101,700	104,200	117,800	121,000	144,000	144,200
Next 60.....	51,000	66,200	61,400	65,200	69,900	74,200	80,100	90,700	96,400	98,000	118,800	130,400	124,100	123,800
Next 100.....	41,600	49,900	52,400	53,400	57,200	58,700	63,400	71,400	87,900	99,200	96,300	108,900	122,800	118,100
Next 200.....	39,700	44,000	43,600	48,300	54,200	56,900	61,200	72,800	79,900	86,900	86,400	97,300	94,100	98,600
Average of above 400 R&D performing companies.....	57,200	66,900	70,400	74,300	78,100	82,200	88,500	96,600	114,400	118,500	125,400	139,000	144,400	149,400

(1) See note on table B-53.

SOURCE: National Science Foundation, SRS

Table B-56. Total employment of R&D-performing companies
by industry and size of company: 1984-86

Industry	SIC code	1984							1985						
		Companies with total employment of--							Companies with total employment of--						
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more	Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total.....		15,685	(2)	(2)	1,771	1,323	3,122	8,039	15,200	(2)	(2)	1,667	1,403	2,953	7,894
Food, kindred, and tobacco products.....	20,21	1,346	(2)	(2)	(2)	179	296	688	1,268	(2)	(2)	(2)	178	259	659
Textiles and apparel.....	22,23	531	31	(2)	(2)	82	162	111	497	(2)	(2)	(2)	94	139	97
Lumber, wood products, and furniture.....	24,25	288	(1)	(2)	67	58	43	(2)	290	18	(2)	(2)	60	53	(2)
Paper and allied products.....	26	507	(2)	(2)	(2)	53	178	189	489	(2)	(2)	(2)	52	188	165
Chemicals and allied products.....	28	1,240	(2)	30	136	83	388	545	1,295	(2)	29	136	101	329	645
Industrial chemicals.....	281-82,286	594	(2)	6	34	51	77	412	621	(2)	6	31	59	64	449
Drugs and medicines.....	283	348	(2)	(2)	34	14	196	91	385	(2)	(1)	35	24	158	(1)
Other chemicals.....	284-85,287-89	297	(2)	19	69	18	115	42	289	(2)	(1)	70	19	108	(1)
Petroleum refining.....	29	618	(2)	(1)	14	(1)	92	491	566	(1)	(2)	14	(1)	67	464
Rubber products.....	30	430	86	(2)	64	29	53	177	395	82	(1)	51	41	99	(1)
Stone, clay, and glass products.....	32	349	(2)	(1)	(2)	50	154	(1)	346	(2)	(2)	(2)	68	115	86
Primary metals.....	33	714	(2)	(2)	108	80	194	289	687	(2)	(2)	83	110	208	245
Ferrous metals and products.....	331-32,3398-99	522	(1)	(2)	78	57	117	255	496	(1)	(2)	59	76	129	(1)
Nonferrous metals and products.....	333-34	192	(1)	(2)	37	23	76	34	191	(1)	(2)	24	34	79	(1)
Fabricated metal products.....	34	471	66	(2)	104	99	86	(2)	434	(1)	(2)	91	101	122	(1)
Machinery.....	35	1,557	(2)	61	273	104	341	598	1,526	(2)	57	255	136	250	649
Office, computing, and accounting machines.....	357	657	(1)	17	68	(1)	81	461	677	(2)	14	62	30	73	480
Other machinery, except electrical.....	351-56,358-59	900	(1)	45	204	(1)	260	137	849	(2)	44	193	106	177	169
Electrical equipment.....	36	2,430	(2)	(2)	194	146	315	1,618	2,303	(2)	(2)	192	134	276	1,547
Radio and TV receiving equipment.....	365	180	(2)	(2)	11	(2)	37	(1)	126	(2)	5	12	(1)	34	(1)
Communication equipment.....	366	1,101	(2)	8	39	37	111	882	1,039	(2)	(2)	41	20	101	847
Electronic components.....	367	401	(2)	(2)	53	35	53	210	400	(2)	(2)	53	31	54	212
Other electrical equipment.....	361-64,369	748	(2)	(2)	91	68	115	(1)	739	(2)	(2)	87	(1)	87	(1)
Transportation equipment.....	37	2,150	(2)	(1)	82	(1)	209	1,753	2,233	(2)	(2)	81	58	194	1,855
Motor vehicles and motor vehicles equipment.....	371	1,078	(2)	(2)	(2)	37	106	861	1,107	(2)	(2)	(2)	(2)	81	917
Other transportation equipment.....	373-75,379	133	(2)	(2)	20	7	12	(2)	117	(2)	(2)	(2)	(1)	(1)	(1)
Aircraft and missiles.....	372,376	947	12	(1)	21	(1)	91	804	1,009	10	3	22	(1)	(1)	(1)
Professional and scientific instruments.....	38	617	(2)	30	76	45	87	322	604	(2)	34	75	45	109	286
Scientific and mechanical measuring instruments..	381-82	291	(1)	17	47	21	(1)	144	282	(1)	21	45	22	57	(1)
Optical, surgical, photographic, and other instruments.....	383-87	326	(1)	13	29	24	(1)	178	323	(1)	13	30	23	52	(1)
Other manufacturing industries.....	27,31,39	482	(2)	(2)	107	(2)	126	107	484	(2)	(2)	103	(2)	149	(2)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	1,877	117	(2)	(2)	176	399	919	1,782	90	(2)	(2)	160	395	868

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-36. Total employment of R&D-performing companies
by industry and size of company: 1984-86 (continued)

		1986						
Industry	SIC code	Companies with total employment of--						
		Total	Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Total.....		14,619	786	436	1,668	1,263	2,871	7,595
Food, kindred, and tobacco products.....	20,21	1,353	26	43	121	136	223	807
Textiles and apparel.....	22,23	470	18	(2)	90	74	80	149
Lumber, wood products, and furniture.....	24,25	364	20	12	68	47	81	137
Paper and allied products.....	26	484	10	6	67	43	209	148
Chemicals and allied products.....	28	1,113	52	27	129	92	325	488
Industrial chemicals.....	281-82,286	510	13	5	27	55	91	318
Drugs and medicines.....	283	335	(1)	6	32	18	150	(1)
Other chemicals.....	284-85,287-89	268	(1)	17	69	19	84	(1)
Petroleum refining.....	29	507	(1)	3	6	(1)	(1)	405
Rubber products.....	30	372	(1)	25	55	(1)	108	69
Stone, clay, and glass products.....	32	352	24	20	38	50	130	89
Primary metals.....	33	612	25	15	91	93	174	214
Ferrous metals and products.....	331-32,3390-99	431	17	5	62	(1)	97	(1)
Nonferrous metals and products.....	333-34	181	8	10	29	(1)	78	(1)
Fabricated metal products.....	34	417	(1)	32	100	84	119	(1)
Machinery.....	35	1,416	162	67	230	134	206	615
Office, computing, and accounting machines.....	357	631	18	14	50	25	49	476
Other machinery, except electrical.....	351-56,358-59	785	144	53	180	109	158	140
Electrical equipment.....	36	2,050	107	40	179	83	341	1,300
Radio and TV receiving equipment.....	365	53	(1)	5	10	(1)	25	0
Communication equipment.....	366	920	(1)	4	29	(1)	100	749
Electronic components.....	367	375	33	11	65	(1)	76	(1)
Other electrical equipment.....	361-64,369	702	(1)	20	75	45	139	(1)
Transportation equipment.....	37	2,185	(1)	19	101	55	(1)	(1)
Motor vehicles and motor vehicles equipment.....	371	1,120	(2)	12	60	36	80	925
Other transportation equipment.....	373-75,379	122	3	2	20	(1)	(1)	(1)
Aircraft and missiles.....	372,376	943	(1)	5	20	(1)	68	828
Professional and scientific instruments.....	38	570	56	26	80	57	66	285
Scientific and mechanical measuring instruments..	381-82	264	26	16	42	20	(1)	(1)
Optical, surgical, photographic, and other instruments.....	383-87	306	31	10	38	37	(1)	(1)
Other manufacturing industries.....	27,31,39	471	52	17	90	49	177	(2)
Nonmanufacturing industries.....	10-17,41-67,737, 739,807,891	1,881	84	24	225	202	402	944

(1) Data have been withheld to avoid disclosing operations of individual companies.

(2) Data have been withheld due to imputation of 50 percent or more.

SOURCE: National Science Foundation, SRS

Table B-57. R&D scientists and engineers per 1,000 employees by industry and size of company: 1958, 1963, 1967, 1972, and 1974-86

Industry and size of company	SIC code	1958	1963	1967	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Distribution by industry																		
Total.....		21	28	27	24	25	26	27	27	27	27	27	29	33	35	38	40	43
Food, kindred, and tobacco products(2).....	20,21	6	7	7	7	7	7	7	7	7	6	5	6	6	6	7	8	7
Textiles and apparel.....	22,23	1	3	3	3	3	3	3	3	3	3	3	3	4	4	5	4	4
Lumber, wood products, and furniture.....	24,25	5	4	4	6	7	7	7	7	7	6	6	(1)	(1)	(1)	7	7	6
Paper and allied products.....	26	6	6	6	8	8	10	12	12	14	14	14	16	16	16	17	18	19
Chemicals and allied products.....	28	39	40	36	39	40	41	40	42	43	42	42	44	51	54	54	53	61
Industrial chemicals.....	281-82,286	42	40	33	34	37	38	36	38	38	36	36	37	44	45	44	42	53
Drugs and medicines.....	283	46	47	51	60	57	59	64	62	65	62	60	66	74	(1)	88	81	90
Other chemicals.....	284-85,287-89	30	38	33	31	30	29	28	29	27	27	30	33	36	36	38	39	40
Petroleum refining.....	29	15	17	18	16	18	19	17	17	19	18	17	20	22	22	22	21	19
Rubber products.....	30	19	20	17	16	17	18	18	19	18	(1)	(1)	25	(1)	(1)	32	33	34
Stone, clay, and glass products.....	32	(1)	12	14	10	11	11	11	12	13	13	13	13	14	14	14	15	15
Primary metals.....	33	5	5	5	5	5	7	8	8	8	7	7	8	10	11	12	17	22
Ferrous metals and products.....	331-32,3398-99	4	4	4	4	4	5	5	5	6	6	6	6	8	10	11	16	23
Nonferrous metals and products.....	333-36	6	8	8	7	7	11	15	13	12	12	12	13	14	15	15	17	20
Fabricated metal products.....	34	16	15	14	10	11	12	12	12	12	12	14	15	(1)	(1)	17	17	16
Machinery.....	35	22	28	28	31	34	36	38	38	39	38	36	35	45	51	49	52	56
Office, computing, and accounting machines.....	357	(3)	(3)	(3)	46	69	76	79	78	79	75	72	71	75	78	79	81	89
Other machinery, except electrical.....	351-56,358-59	(4)	(4)	(4)	(4)	(4)	(4)	(4)	18	19	19	18	19	26	30	28	29	30
Electrical equipment.....	36	43	55	43	37	37	40	42	42	41	43	44	48	56	52	48	51	61
Radio and TV receiving equipment.....	365	(5)	(5)	18	26	18	16	15	17	22	29	35	51	(1)	(1)	28	22	51
Communication equipment.....	366				42	43	44	45	46	48	53	55	56	73	60	52	55	66
Electronic components.....	367	52	67	52														
Other electrical equipment.....	361-64,369	37	41	35	31	32	36	38	35	32	32	32	34	(1)	(1)	41	42	45
Transportation equipment.....	37															62	62	66
Motor vehicles and motor vehicles equipment.....	371				23	24	25	25	24	26	26	30	30	31	30	27	28	28
Other transportation equipment.....	373-75,379	16	19	20														
Aircraft and missiles.....	372,376	72	99	89	76	72	72	78	85	96	93	92	98	99	106	107	105	116
Professional and scientific instruments.....	38	44	36	32	33	35	38	41	41	42	41	39	46	(1)	(1)	75	83	91
Scientific and mechanical measuring instruments....	381-82	57	38	26	31	35	41	45	45	50	(1)	(1)	(1)	(1)	(1)	104	117	127
Optical, surgical, photographic, and other instruments.....	383-87	33	35	35	34	35	37	38	41	44	45	48	47	(1)	(1)	49	53	60
Other manufacturing industries.....	27,31,39		9	6	6	6	7	8	7	9	7	7	7	9	(1)	12	14	15
Distribution by size of company (based on number of employees)																		
Less than 500.....		18	27	28	28	29	26	25	24	25	24	25	28	30	35	33	33	36
500 to 999.....																22	23	22
1,000 to 4,999.....		12	19	16	19	17	17	17	17	18	18	19	21	22	26	26	28	29
5,000 to 9,999.....				15	19	18	17	19	20	17	19	19	18	23	23	20	21	29
10,000 to 24,999.....		25	31		16	16	17	18	19	20	19	20	23	26	27	30	32	33
25,000 or more.....				31		31	33	35	34	35	34	34	36	43	42	47	49	54

Note: The number of R&D scientists and engineers for 1986 is derived by dividing the arithmetic mean of scientists and engineers employed in January 1986 and January 1987 by the number of company employees in all activities in March 1986. Similar procedures were used in earlier years except 1967-69 in which data were derived by dividing the number-years of R&D scientists and engineers for the year by the March employment figures. Nonmanufacturing industries are included in the calculations for 1958-83.

- (1) Not separately available but included in total. See general notes.
 (2) Until 1984, tobacco products, SIC 21, was included with "other manufacturing industries."
 (3) Data not tabulated at this level prior to the 1972 survey.
 (4) Data not tabulated at this level prior to the 1977 survey.
 (5) Included in the other electrical equipment group for 1958-63.

Table B-58. Total and company R&D funds per employee by size of company: 1963, 1967, 1972, and 1974-86

Size of company (based on number of employees)	1963	1967	1972	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Total R&D funds per employee																
Total.....	\$1,110	\$1,180	\$1,386	\$1,624	\$1,728	\$1,912	\$2,077	\$2,240	\$2,453	\$2,576	\$3,010	\$3,719	\$4,163	\$4,579	\$5,148	\$5,514
Less than 500.....	520	640	892	1,010	1,043	1,139	1,051	1,123	1,254	1,418	1,634	1,732	2,186	2,767	3,028	3,221
500 to 999.....														2,158	2,238	2,173
1,000 to 4,999.....	500	570	757	791	786	852	963	1,066	1,321	1,326	1,596	1,790	2,042	2,480	2,725	2,971
5,000 to 9,999.....		560	736	879	930	1,130	1,261	1,143	1,102	1,332	1,668	1,883	2,194	2,505	2,851	3,353
10,000 to 24,999.....	1,310		781	837	920	1,041	1,215	1,407	1,549	1,748	2,045	2,469	2,966	3,385	3,500	3,507
25,000 or more.....		1,470														
			1,962	2,421	2,644	2,829	2,994	3,045	3,614	3,594	4,193	5,502	5,785	6,184	7,071	7,620
Company R&D funds per employee																
Total.....	\$470	\$580	\$818	\$1,040	\$1,112	\$1,233	\$1,347	\$1,487	\$1,630	\$1,764	\$2,059	\$2,534	\$2,814	\$3,095	\$3,383	\$3,614
Less than 500.....	340	420	579	657	810	893	879	933	956	1,176	1,333	1,381	1,749	2,212	2,407	2,479
500 to 999.....														1,782	1,700	1,597
1,000 to 4,999.....	340	370	525	572	642	699	790	841	910	1,100	1,311	1,503	1,687	2,096	2,316	2,527
5,000 to 9,999.....		420	609	729	749	921	1,004	989	987	1,048	1,323	1,551	1,613	2,199	2,409	2,746
10,000 to 24,999.....	520		557	688	791	842	927	1,077	1,237	1,414	1,675	2,025	2,351	2,689	2,769	2,868
25,000 or more.....		660														
			1,059	1,432	1,519	1,651	1,781	1,873	2,271	2,273	2,641	3,436	3,637	3,792	4,208	4,512

Note: Averages were derived by dividing total and company R&D funds for a calendar year by employment figures for March of that year.

SOURCE: National Science Foundation, SRS

Table B-59. Percent of employment of R&D-performing companies ranked by size of total R&D funds: 1984-86

	1984	1985	1986
First 4 (1-4).....	8	8	8
Next 4 (5-8).....	3	4	4
Next 12 (9-20).....	6	7	7
Next 20 (21-40).....	9	7	8
Next 60 (41-100).....	10	11	10
Next 100 (101-200)...	13	12	11
Next 200 (201-400)...	15	15	17

Source: National Science Foundation, SRS

SECTION C. INDUSTRY-ADMINISTERED
FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS

Supported by the Department of Energy:

Bettis Atomic Power Laboratory
Westinghouse Electric Corporation
Pittsburgh, Pennsylvania

Hanford Engineering Development Laboratory
Westinghouse-Hanford Corporation
Richland, Washington

Idaho National Engineering Laboratory
EG&G Idaho, Inc.; Exxon Nuclear Idaho Company; Argonne National
Laboratory, West; Westinghouse Electric Corporation
Idaho Falls, Idaho

Knolls Atomic Power Laboratory
General Electric Company
Schenectady, New York

Oak Ridge National Laboratory
Martin Marietta Corporation
Oak Ridge, Tennessee

Sandia National Laboratories
Western Electric Company, Inc.--Sandia Corporation
Albuquerque, New Mexico

Savannah River Laboratory
E.I. duPont de Nemours & Company, Inc.
Aiken, South Carolina

Supported by the National Institutes of Health, Department of
Health and Human Services:

Federick Cancer Research Facility
Program Resources, Inc.
Frederick, Maryland

SECTION D. SURVEY INSTRUMENTS

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NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550



OFFICE OF THE
DIRECTOR

Dear Respondent:

The National Science Foundation requests your company's participation in its 1986 Survey of Industrial Research and Development by completing the enclosed questionnaire and returning it to the U.S. Bureau of the Census.

This annual survey is the only source of detailed information on U.S. industrial firms' performance of research and development, which accounts for approximately 70 percent of total U.S. R&D expenditures. It is important, therefore, that data from every company are included so that the survey results will be accurate and complete. If your records do not contain the information requested for one or more of the data elements, it is important that you provide an estimate(s). Your estimates are adequate substitutes for actual data as long as they are consistent from year to year and are based on reasonable assumptions. If you have not done so already, you may wish to ask your company's chief official responsible for research and development to assist in completing the survey.

It may interest you to know that the National Science Foundation receives many requests for these R&D data from industry officials. We have been informed that the data are used in assessing and planning R&D programs. In addition, this survey is a primary source of information necessary in evaluating this country's investment in research and development and in formulating effective public policies that promote and strengthen industry's role in scientific and technological innovation.

Your company's responses are kept confidential--the Foundation receives the data from the Census Bureau only after they have been aggregated by individual industries. Inquiries regarding the conduct of the survey should be directed to the U.S. Department of Commerce, Bureau of the Census, Industry Division, Washington, D. C. 20233.

We appreciate both your past and continuing participation in this survey. If you would like to receive the results of this survey or if you have a suggestion for improving any aspect of the survey, please contact Mr. William L. Stewart, Division Director, Division of Science Resources Studies, Room L-602, National Science Foundation, Washington, D. C. 20550.

Sincerely yours,



Erich Bloch
Director



UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, D.C. 20233

OFFICE OF THE DIRECTOR

FROM THE DIRECTOR
BUREAU OF THE CENSUS

The Bureau of the Census conducts the "Survey of Industrial Research and Development" under sponsorship of the National Science Foundation. These measures of research and development expenditures by industry are important in analyzing and forecasting long-term economic growth, investigating productivity determinants, formulating tax policy recommendations, and comparing individual research performance against industry averages.

We are enclosing your report form and file copy for the "Survey of Industrial Research and Development During 1986" (RD-1). To reduce response burden, we alternate between a "long" and a "short" form every other year. We are using the "short" version for 1986.

We also are enclosing an updated instruction manual to assist you in completing the report and a letter from the National Science Foundation describing the importance of the survey results. Please read the instruction manual carefully, since it provides guidelines for reporting. We recognize that you may not maintain book records for particular items. In such cases, please use carefully prepared estimates.

The law (Title 13, United States Code) authorizes this report. Items 1A and 1B and Columns 2 and 4 of Item 4C are part of the basic statistical program of the Bureau of the Census for manufacturing companies, and reporting of these items is mandatory. Response to the remainder of the inquiries is voluntary; however, we need your cooperation to make the results of the survey comprehensive and accurate. By Section 9 of the same law (Title 13), your report to the Census Bureau is confidential. Only sworn Census Bureau employees will see the information reported and will use it only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

Please return the completed form within 60 days. Please direct requests for copies of the resulting publication or any questions concerning this survey to the Special Projects Branch of our Industry Division on (301) 763-5508. If you need additional time to complete the report or need additional forms, call (800) 288-3331. We appreciate your past cooperation in this important survey and look forward to your continued participation. Thank you.

Sincerely,

A handwritten signature in dark ink, reading "John G. Keane". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

JOHN G. KEANE

Enclosures

INSTRUCTIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1986

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GENERAL

Estimates are Acceptable — Reporting on this form may require using informed estimates in answering some of the questions. These estimates are satisfactory if they are sufficient to develop both meaningful totals and, especially, measures of change from year to year. Direct any questions regarding this form to the Bureau of the Census, ATTN: Industry Division, Washington, D.C. 20233, or call (301) 763-5598.

Companies Reporting in Survey for the First Time — Companies which did not report in the 1985 survey are asked to provide figures for both 1985 and 1986. If the company had no expenditures for research and development, complete only Item 1. Enter "No R&D" in the space for remarks on page 2 of the form, sign, and return the form.

Figures for Earlier Years are Preposted on the Form — If your company reported for 1985, entries from that form have been copied on the present form.

Please describe in the "Remarks" section (page 2 of the form) the reasons for any substantial increases or decreases in the 1986 figures entered on this form when compared to corresponding 1985 figures. Examples of such reasons are new government contracts, acquisitions, and divestitures, revised accounting method, etc. If you acquired or disposed of a unit performing an important amount of research

and development during the 2-year period, please identify the unit in "Remarks," and give the total amount of research and development accounted for by such unit.

Revision of Earlier Year Figures — The 1985 figures should be revised if necessary to assure comparability with 1986 data. Please explain in "Remarks" any significant change made in the 1985 figures. If your company did not report for 1985, or if no entries have been entered in the 1985 column, fill in the figures for both years.

Report for Your Entire Company — Research and development (R&D) activities for your entire domestic company should be reported, including all subsidiaries, divisions, etc.

Period Covered by Report — The figures reported should cover the calendar year if possible. Fiscal year data, however, are acceptable for all items except employment, provided your fiscal year ends between September and March. Please report employment figures (Item 1B and Item 3) for the specific period identified in each of the items mentioned.

Geographic Area Covered — The data relate to business firms which operate one or more establishments in one or more of the 50 States or the District of Columbia.

▶ **Section I — GENERAL COMPANY DATA**

▶ **Item 1 — Sales and Employment for Company**

▶ **Item 1A — Net Sales** — Report the net sales and receipts of this company and its subsidiaries to customers outside the company, including sales of products and services to other companies, individuals, U.S. Government agencies, foreign customers; etc. Include transfers to foreign subsidiaries. Exclude domestic intra-company transfers and sales by foreign subsidiaries. The reported figures should represent value f.o.b. plant after discounts and allowances and should exclude freight charges and excise taxes.

▶ **Item 1B — Employment** — Report the number of persons employed at the company in all activities in the 50 States and the District of Columbia during the pay periods which include March 12 of 1985 and 1986. This figure would be the same as that shown by the company in Item 14 of Treasury Form 941, if the company filed one Form 941 for the entire company.

▶ **Section II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES**

▶ **Item 2 — RESEARCH AND DEVELOPMENT EXPENDITURES**

Definition of Research and Development — Research and development includes basic and applied research in the sciences and in engineering, and design and development of prototype products and processes. For the purposes of this questionnaire, research and development includes activities carried on by persons trained, either formally or by experience, in the physical sciences including related engineering, and the biological sciences including medicine but excluding psychology, if the purpose of such activity is to do one or more of the following things:

1. Pursue a planned search for new knowledge, whether or not the search has reference to a specific application.
2. Apply existing knowledge to problems involved in the creation of a new product or process, including work required to evaluate possible uses.
3. Apply existing knowledge to problems involved in the improvement of a present product or process.

Research and development includes the activities described above whether assigned to separate R&D organizational units of the company or carried on by company laboratories and technical groups not part of an R&D organization. Reporting the R&D activities of such latter groups may require the use of estimates for some of the questions.

Activities to be Excluded From Research and Development — Research and development for purposes of this survey excludes capital expenditures, routine product testing, research in the social sciences or psychology, or other nontechnological activities or technical services. Please exclude geological and geophysical exploration activities; include, however, the research and development conducted in support of such activities, such as the development or improvement of techniques and processes.

More specifically, exclude from research and development such nontechnological activities as market research, including statistical surveys, market development, economic research, and legal work in connection with patent applications and litigation, and the sale of licensing of patents.

Also exclude from research and development such technical services as: quality and quantity control tests and analyses; troubleshooting in connection with breakdowns in full-scale production, including related analytical work; work required for minor adaptations of a specific product to meet the requirements of a specific customer, including installation and servicing in a customer's plant; engineering and other technical services furnished in accordance with agreements to licensees outside the company; technical plant sanitation control; aid furnished by the R&D organization to manufacturing divisions to enable them to operate in accordance with previously determined formulas, standard practice instructions, or finished product specifications; aid furnished to develop advertising programs and to promote or demonstrate new products or processes, including the cost of material furnished for trial or demonstration; assistance in preparation of speeches and publications for persons not engaged in research and development; and experimental work performed at the request of the patent division to provide information needed during the prosecution of a patent litigation.

▶ **Item 3 — Research and Development Scientists and Engineers** — Scientists and engineers are defined for this survey as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics that is equivalent at least to that acquired through completion of a four-year college course with a major in these fields, regardless of whether they actually hold a college degree in the field.

The figure for R&D scientists and engineers will be obtained primarily from two sources:

1. Records on the number of scientists and engineers assigned to research and development. This source is satisfactory as long as the scientists and engineers of the unit are assigned to research and development on a full-time basis (i.e., no more than 5 percent of their time is spent on nonresearch and development). For example, for company laboratories performing only research and development, report the number of scientists and engineers on the rolls in January. For other units, use source 2.
2. Figures on the proportion of total work time of scientists and engineers that is devoted to research and development. For example, if the engineering department of a manufacturing plant had 60 scientists and engineers in January 1987 and one-fourth of the scientists' and engineers' time during that month was charged to R&D projects, the figure for the number of R&D scientists and engineers included for that unit would be 15.

Separate figures are requested on the number of scientists and engineers working on Federal R&D projects, and company and other R&D projects. Where R&D work for the Government and for the company is performed by the same group of scientists and engineers, distribute the total number of such scientists and engineers according to the program, Federal or company, for which the R&D work was performed.

► **Item 4 — Cost INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED Within the Company by Major Type and Source of Funds** — Include all costs incurred to support research and development including R&D depreciation and overhead but excluding R&D capital expenditures. If you perform research and development for others on contract, report the total charged for the work performed, including profit.

Include in R&D expenditures the full cost of all research and development performed. Do not net your R&D expenditures by the amount of royalties received from either non-company organizations or company units, or the credits received for R&D work charged or "sold" to other units of the reporting company or to outside organizations.

The relevant costs for research and development usually include but are not limited to the elements listed below:

1. Wages, salaries, and related costs; materials and supplies consumed (or purchased, if consumption figures are not available); costs of computer software used in R&D activities; utilities, such as telephone, telex, electricity, water, gas, and fuel; books and periodicals; travel costs and professional dues.

2. Property taxes and other taxes (except income taxes) incurred on account of the R&D organization or the facilities which the R&D organization uses; insurance expense; maintenance and repair, including the maintenance of buildings and grounds; depreciation on buildings, equipment, and vehicles; and rentals, if any facilities are leased.

3. Company overhead. Estimate a fair share of the cost of any functions which support activities. The basis and method of estimating overhead costs will depend upon company practice. Be sure that all companies include an allowance for overhead. Items normally covered in overhead include the following: Personnel; accounting; procurement and inventory, including purchasing, storage, transportation, control, and of materials and supplies, etc.; other services, including legal, public relations; and salaries and related costs of research executives not on the payroll of the R&D organization.

Types of Costs to be Excluded from Research and Development Performed Within the Company — Exclude capital expenditures, royalties paid, patent expense, income taxes, and interest; the portion of company-held R&D contracts which were subcontracted to R&D organizations outside the reporting company; and income from the sale of products manufactured in the R&D organization if these were sold to bonafied customers. Also exclude the cost of research and development performed for the company by noncompany R&D organizations of any kind. (All work that was done for your laboratories and other technical units by noncompany organizations which are **not** R&D organizations — for example, model construction by a non company model shop — is to be included as a **purchase** of equipment, material, or supplies for the company research organization rather than as subcontracted research and development.) Exclude fellowships, grants, gifts to promote research and development or the study of science and engineering.

Methods of Estimating research and Development Expenditures by Type — (Basic, Applied, and Development) — If your company does not keep records that meet or can be allocated to these specific categories, estimate by:

1. Isolating the projects that clearly fall in the development category. If your company fabricates products, such development activity will include the design, construction, and testing of prototypes and models. Some defense contracts typically call for several test models. If your company's research and development frequently involves the development of a "process" as in chemicals and petroleum, such development activity would include operations beyond the bench scale, primarily the design and operations of pilot plants or semiworks.

2. Isolating the organizational units which have R&D activities that can be readily classified, based on the function assigned to the unit. If R&D work is done in production units as well as in various laboratories, it is generally of a development type.

3. Distributing the balance on the basis of a review of individual projects or on the basis of other summaries of the work. Please use the definitions for basic, applied, and development, as given below.

Types of Research

► **Item 4A — Basic Research** — Include the cost of research projects which represent original investigation for the advancement of scientific knowledge and which do not have specific commercial objectives, (although they may be in the fields of present or potential interest to the reporting company.)

► **Item 4B1 — Applied Research** — Include the cost of research projects which represent investigation directed to discovery of new scientific knowledge and which have specific commercial objectives with respect to either products or processes.

Note that the chief difference between this definition of applied research and the definition of basic research is in terms of the objectives of the reporting company.

► **Item 4B2 — Development** — Include the cost of projects which represent technical activity concerned with nonroutine problems encountered in translating research findings or other general scientific knowledge into products or processes. Exclude routine technical services to customers or other items excluded from the definition of total research and development in Item 2 on page 2.

Types of Activity Included in Development — Include the design and operation of pilot plants or semiworks plants as long as the principal purposes are to obtain experience and to compile engineering and other data to be used in such tasks as evaluating hypotheses, writing product formulas, establishing finished product specifications, designing special equipment and structures required by a process, and preparing operating instructions or manuals. Also include the engineering activity required to advance the design of a product or a process to the point where it meets specific functional and economic requirements and can be turned over to manufacturing units. Include the design, construction, and testing of preproduction prototypes and models and "engineering follow through" in the early production phase; the development of designs for special manufacturing equipment and tools; the preparation of reports, drawings, formulas, specifications, standard practice instructions or operating manuals, and other media used to transmit to operating units information obtained from the above activities.

Types of Activity Excluded from Development — Exclude activities such as toolmaking and tool tryout, production of detailed construction drawings and manufacturing blueprints, and preproduction planning.

It is often difficult to decide when development ends and production begins. In general, if the primary objective is to make further improvements on the product or process, then the work comes within the definition of research and development. If, on the other hand, the product or process is substantially "set," and the primary objective is to develop market, do preproduction planning, or get the production process going smoothly, then the work is no longer research and development.

Source of Funds — Federal and Company

- ▶ **Item 4, Column 2 — Federal —** Include the cost of work done on Federal R&D contracts or subcontracts, and the R&D portions of procurement contracts and subcontracts during the year.

Do not include here, or elsewhere in the report, R&D contracts and the R&D portions of procurement contracts that you subcontracted to other R&D organizations. To do so would cause duplication in the statistical totals derived from these forms, which collect data on work actually performed by each company.

- ▶ **Item 4, Column 3 — Company and Other —** Include the cost of all company-sponsored research and development performed within the company as well as the research and development your company performed under contract from non-Federal sources. Exclude the research and development that was sponsored by your company but performed outside the company.

- ▶ **Item 4E — Company and Other Funds, except Federal, Budgeted for the year 1987 —** Report the expected or estimated cost of company-sponsored or other non-federally sponsored research and development that will be performed within the company within the 50 States and the District of Columbia.

- ▶ **Item 5 — Research and Development by Functional Category**

- ▶ **Item 5A to 5E — Energy Research and Development —** Include all spending for research and development to increase energy resources or capabilities, including the development of energy equipment. Energy research and development can include costs of R&D projects (both product and process) on exploration, extraction, transportation, processing, storage, generation (including conversion), distribution, conservation, etc., of present, new, or improved forms of energy. Record energy R&D spending according to type of energy in Item 5A through 5E.

If R&D spending is for joint or multiple purposes, estimate and report the portion of cost incurred for the energy purpose. In the limited number of cases where the separation of joint (multiple) costs by type of energy cannot be estimated, include the total cost of the R&D project when the **primary** purpose of the project is energy research and development. If the project is not primarily for energy research and development then exclude all of the project cost.

- ▶ **Item 5C — "Conservation and Utilization" —** Includes R&D activities undertaken to reduce consumption either at the point of energy use or in the transmission, transportation, storage, and conversion of energy. Examples of such are research and development undertaken primarily to reduce fuel consumption in manufacturing, to improve the efficiency of transportation of energy products, or to produce an end product which is more efficient in energy consumption.

- ▶ **Item 5D — "All Other Energy" —** Includes areas such as wind, waste, hydroelectric, etc. Also include in this category the development of energy equipment which cannot adequately be classified in Items 5A to 5C.

- ▶ **Item 5F — Pollution Abatement Research and Development —** Include R&D spending for the purpose of reducing or eliminating the emission of pollutants. "Pollution" refers to the emission of pollutants to the outside of a firm's (or household's) property or activities; "abatement" includes prevention, treatment, or recycling. Exclude spending to contribute to environmental aesthetics, to increase equipment durability in corrosive environments, to conserve energy (include as energy research and development in Item 5C) and natural resources, or to increase employee comfort, safety, and health.

If the only purpose of the R&D spending is pollution abatement, include the total expenditures on the R&D project. (Examples are spending on projects to improve or design alternatives to electrostatic precipitators, wet scrubber systems, waste treatment systems, effluent monitoring devices, etc.) If pollution abatement is only one of several purposes, estimate and report only the portion of R&D costs incurred due to the pollution abatement purpose. (Examples of multipurpose projects are those designed to improve production processes or products while simultaneously reducing the emission of pollutants, or pollution abatement projects combined with other purposes such as energy conservation or employee safety and health.)

In the limited number of cases where the separation of joint costs is not feasible, include the total cost of the R&D project when the purpose is primarily (more than 50 percent) for pollution abatement.

If the project is not primarily for pollution abatement, then exclude all of the project cost. Also exclude project costs if expected pollution abatement benefits are incidental. (Incidental benefits are those obtained at no extra cost.)

- ▶ **Item 6 — Total Company Funds Spent for Research and Development Activities Performed by Foreign Subsidiaries Outside the United States —** Report the amount of research and development financed by the U.S. parent or its foreign subsidiaries and performed by company R&D laboratories, branch plants, divisions, etc., or by other organizations, located outside the United States. This item excludes R&D activities performed by foreign subsidiaries which were financed by foreign governments or other outside organizations.

NOTE — Foreign subsidiaries are those outside the 50 States or the District of Columbia.

NOTICE — Your report to the Census Bureau is confidential by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

**CENSUS
USE
ONLY**

FORM **RD-1**
5-13-85

**SURVEY OF INDUSTRIAL RESEARCH AND
DEVELOPMENT DURING 1985**

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

RETURN TO: Bureau of the Census
1201 East Tenth Street
Jeffersonville, Indiana 47132

SURVEY CODE

4001

INDUSTRY CODE

WEIGHT

STATE

ADDRESS

SIC CODE

Name of person who supplied 1984 data

Data supplied in items 1A and 1B and in item 4C, columns 2 and 4, for 1985 on this form, will satisfy the mandatory reporting requirement of Census Form MA-121 (title 13, U.S. Code). Your cooperation on the other items is essential to make the results of this survey comprehensive, accurate, and timely.

In correspondence pertaining to this report refer to this CENSUS FILE NUMBER (11 digit) ▶

PLEASE RETURN THIS COPY

(Please correct any error in name and address, including ZIP code.)

GENERAL INSTRUCTIONS

- Please complete this form and return within 60 days in the envelope provided. Retain the file copy for your records. THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES, UNLESS OTHERWISE DESIGNATED.

- Enter 0 (zero) where appropriate rather than leaving a blank space.

- Reasonably accurate estimates are acceptable.

- Figures for 1983 are those reported by your company in that year. They are included solely to assist you in reporting 1985 data.

- Figures for 1984 are those reported by your company last year. THE 1984 FIGURES SHOULD BE REVISED, IF NECESSARY, TO BE COMPARABLE WITH 1985 DATA.

- Explain in "Remarks" on the back page any substantial increases or decreases in 1985 figures over 1984 (e.g., new government contracts, acquisitions, mergers, divestitures, etc.).

PLEASE READ ENCLOSED INSTRUCTIONS BEFORE COMPLETING THIS FORM

SECTION I — GENERAL COMPANY DATA

Item 1 — DOMESTIC SALES, RECEIPTS, AND EMPLOYMENT FOR COMPANY

A. Domestic net sales and receipts of this company (Thousands of dollars)

B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1984 and 1985

1984 **1985**

101	102
103	104

SECTION II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES
(Exclude R&D financed by the company but performed by others. Report such R&D in section III.)

Item 2 — RESEARCH AND DEVELOPMENT EXPENDITURES

Are research and development expenditures for entire domestic company, including subsidiaries, reported on this form?

☐ YES ☐ NO — Please explain in remarks or on transmittal letter

Item 3 — NUMBER OF SCIENTISTS AND ENGINEERS INVOLVED IN RESEARCH AND DEVELOPMENT ACTIVITIES

Apportion on a full-time equivalent basis. (See instruction manual)

A. Federal research and development

B. Company and other research and development

C. TOTAL (Sum of A and B)

January 1985 **January 1986**

111	112
113	114

Item 4 — COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE AND SOURCE OF FUNDS

Include R&D depreciation and overhead; exclude R&D capital expenditures. (See instruction manual)

A. Basic research If "None," please mark (X) ☐

B. Applied research and development

1. Applied research

2. Development

3. TOTAL (Sum of lines 1 and 2)

C. TOTALS (Sum of A and B3)

D. 1984 TOTALS

E. Company and other funds, except Federal, budgeted for the year 1986

Thousands of dollars

1984	1985		
TOTAL research and development (1)	Federal funds (2)	Company and other funds, except Federal (3)	TOTAL (Sum of columns 2 and 3) (4)
201	202	203	204
211	212	213	214
221	222	223	224
231	232	233	234
241	242	243	244
251	252	253	254
261	262	263	264
271	272	273	274
281	282	283	284
291	292	293	294
301	302	303	304
311	312	313	314
321	322	323	324
331	332	333	334
341	342	343	344
351	352	353	354
361	362	363	364
371	372	373	374
381	382	383	384
391	392	393	394
401	402	403	404
411	412	413	414
421	422	423	424
431	432	433	434
441	442	443	444
451	452	453	454
461	462	463	464
471	472	473	474
481	482	483	484
491	492	493	494
501	502	503	504
511	512	513	514
521	522	523	524
531	532	533	534
541	542	543	544
551	552	553	554
561	562	563	564
571	572	573	574
581	582	583	584
591	592	593	594
601	602	603	604
611	612	613	614
621	622	623	624
631	632	633	634
641	642	643	644
651	652	653	654
661	662	663	664
671	672	673	674
681	682	683	684
691	692	693	694
701	702	703	704
711	712	713	714
721	722	723	724
731	732	733	734
741	742	743	744
751	752	753	754
761	762	763	764
771	772	773	774
781	782	783	784
791	792	793	794
801	802	803	804
811	812	813	814
821	822	823	824
831	832	833	834
841	842	843	844
851	852	853	854
861	862	863	864
871	872	873	874
881	882	883	884
891	892	893	894
901	902	903	904
911	912	913	914
921	922	923	924
931	932	933	934
941	942	943	944
951	952	953	954
961	962	963	964
971	972	973	974
981	982	983	984
991	992	993	994
1001	1002	1003	1004

Item 5 — COSTS INCURRED FOR FEDERAL RESEARCH AND DEVELOPMENT BY PRINCIPAL AGENCY

(Breakdown of item 4C, column 2)

1. Department of Defense

2. National Aeronautics and Space Administration

3. Department of Energy

4. All other Federal Agencies

5. TOTAL COST (Sum of 1, 2, 3, and 4)

Thousands of dollars

1983	1984	1985
301	302	303
304	305	306
307	308	309
310	311	312
313	314	315
316	317	318
319	320	321

Item 6 — COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THIS COMPANY BY MAJOR TYPE OF EXPENSE

A. Wages and salaries of research and development personnel (Include scientists and engineers, technicians, secretaries, and other personnel)

B. Costs of materials and supplies consumed (Do not include in this item components, models, and other materials supplied by other research organizations)

C. Other costs (Include service and supporting costs, R&D depreciation, and share of overhead)

D. TOTAL COSTS (Sum of A through C) (Same as item 4C, column 4)

Thousands of dollars

1983	1984	1985
311	312	313
314	315	316
317	318	319
320	321	322
323	324	325
326	327	328
329	330	331

**SURVEY OF INDUSTRIAL RESEARCH AND
DEVELOPMENT DURING 1985**

SECTION II RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES (Include R&D financed by the company but performed by others. Report such R&D in section III.) Continued

Item 7 - FIELDS OF BASIC RESEARCH

Allocate the total reported in item 4A for basic research into the following fields of science and engineering.

A. Chemistry

B. Engineering (including metallurgy)

C. Geological sciences

D. Mathematics

E. Computer sciences

F. Physics

G. Astronomy

H. Atmospheric sciences

I. Oceanography

J. Biological sciences

K. Clinical medical sciences

L. Other - Specify

M. TOTAL BASIC RESEARCH COST (Same as item 4A, column 4)

Thousands of dollars

1983	1984	1985
	↑	401
	↑	402
	↑	407
	↑	408
	N	409
	O	410
	T	411
	↑	412
	A	413
	S	414
	K	415
	E	416
	D	417
	↓	418

Item 8 - APPLIED RESEARCH AND DEVELOPMENT BY PRODUCT GROUP

Allocate the total reported in 4B, line 3, applied research and development, into the following product groups which represent the END PRODUCT for the firm. (See instructions on how to classify the applied research and development)

1. Food and kindred products

2. Textile mill products

3. Industrial inorganic and organic chemicals

4. Plastics materials and synthetic resins, rubber, and fiber

5. Drugs

6. Agricultural chemicals

7. All other chemicals

8. Petroleum refining

9. Rubber and miscellaneous plastics products

10. Stone, clay, glass, and concrete products

11. Primary ferrous products

12. Primary and secondary nonferrous metals

13. Ordnance, except missiles

14. Fabricated metal products

15. Engines and turbines

16. Farm machinery and equipment

17. Construction, mining, and materials handling machinery

18. Metalworking machinery and equipment

19. Office, computing and accounting machines

20. Other machinery, except electrical

21. Electric transmission and distribution equipment

22. Electrical industrial apparatus

23. Radio and television receiving sets, except communication types

24. Communications equipment

25. Electronic components and accessories

26. Other electrical machinery equipment and supplies

27. Missiles

28. Space vehicles

29. Aircraft and parts

30. Motor vehicles and equipment

31. Other transportation equipment

32. Scientific and mechanical measuring instruments

33. Optical, surgical, photographic, and other instruments

34. Other - Specify

35. TOTAL APPLIED RESEARCH AND DEVELOPMENT COSTS (Same as item 4B3, columns 2 and 4)

Thousands of dollars

1983		1984	1985	
Federal	Total		Federal	Total
		↑	501	502
		↑	503	504
		↑	505	506
		↑	507	508
		↑	509	510
		↑	511	512
		↑	513	514
		↑	515	516
		↑	517	518
		↑	519	520
		↑	521	522
		↑	523	524
		↑	525	526
		↑	527	528
		↑	529	530
		N	531	532
		O	533	534
		T	535	536
		↑	537	538
		A	539	540
		S	541	542
		K	543	544
		E	545	546
		D	547	548
		↓	549	550
		↓	553	554
		↓	555	556
		↓	557	558
		↓	559	560
		↓	561	562
		↓	563	564
		↓	565	566
		↓	567	568
		↓	571	572
		↓	573	574

Item 9 - COST OF RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY, BY STATE

Allocate the totals reported in item 4C, columns 2 and 4, by the States in which your various research and development laboratories or facilities are located. Estimate the costs associated with each State. If necessary, you may report up to 10 percent of your total as "Not distributed by State."

Thousands of dollars						Thousands of dollars					
State	1983		1984	1985		State	1983		1984	1985	
	Federal	Total		Federal	Total		Federal	Total		Federal	Total
1. AL			↑	601	602	27. MT			↑	653	654
2. AK			↑	603	604	28. NE			↑	655	656
3. AZ			↑	605	606	29. NV			↑	657	658
4. AR			↑	607	608	30. NH			↑	659	660
5. CA			↑	609	610	31. NJ			↑	661	662
6. CO			↑	611	612	32. NM			↑	663	664
7. CT			↑	613	614	33. NY			↑	665	666
8. DE			↑	615	616	34. NC			↑	667	668
9. DC			↑	617	618	35. ND			↑	669	670
10. FL			N	619	620	36. OH			↑	671	672
11. GA			O	621	622	37. OK			↑	673	674
12. HI			T	623	624	38. OR			N	675	676
13. ID			↑	625	626	39. PA			O	677	678
14. IL			A	627	628	40. RI			↑	679	680
15. IN			S	629	630	41. SC			A	681	682
16. IA			K	631	632	42. SD			S	683	684
17. KS			E	633	634	43. TN			K	685	686
18. KY			D	635	636	44. TX			E	687	688
19. LA			↑	637	638	45. UT			D	689	690
20. ME			↑	639	640	46. VT			↑	691	692
21. MD			↑	641	642	47. VA			↑	693	694
22. MA			↑	643	644	48. WA			↑	695	696
23. MI			↑	645	646	49. WV			↑	697	698
24. MN			↑	647	648	50. WI			↑	699	700
25. MS			↑	649	650	51. WY			↑	701	702
26. MO			↑	651	652	52. *			↑	703	704
			↓						↓	705	706

53. TOTAL COSTS (Same as item 4C, columns 2 and 4)

Form **RD-1 (Items 10 through 16)**
(6-13-85)

SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1985

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

Refer to this
CENSUS FILE NUMBER
in any correspondence
pertaining to this report

SECTION II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES Continued
(If Exclude R&D financed by the company but performed by others. Report such R&D in section III.)

Item 10 — RESEARCH AND DEVELOPMENT BY FUNCTIONAL CATEGORY
Of the total reported in item 4C, columns 2 and 4, report the following functional categories.

	Thousands of dollars					
	1984		1985		1986	
	Federal funds	Total funds	Federal funds	Total funds	Projected Federal funds	Projected total funds
ENERGY RESEARCH AND DEVELOPMENT Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. Include cost by type of energy.						
A. Total nuclear	801	802	803	804	805	806
1. Fission	NOT ASKED	NOT ASKED	807	808	809	810
2. Fusion			811	812	813	814
B. Total fossil fuels	815	816	817	818	819	820
1. Oil	A	A	821	822	823	824
2. Gas	O	O	825	826	827	828
3. Shale	T	T	829	830	831	832
4. Coal			833	834	835	836
a. Synthetic fuels	S	S	837	838	839	840
b. Mining	K	K	841	842	843	844
c. All other	E	E	845	846	847	848
5. Other fossil fuels	D	D	849	850	851	852
C. Total geothermal, solar, conservation and utilization	853	854	855	856	857	858
1. Geothermal	NOT ASKED	NOT ASKED	859	860	861	862
2. Solar			863	864	865	866
3. Conservation and utilization			867	868	869	870
D. All other energy	871	872	873	874	875	876
E. Total of A through D	877	878	879	880	881	882
POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes. Include cost by form of pollution to be abated.						
F. Air	N	N	901	902	903	904
1. Automotive emissions	O	O	905	906	907	908
2. Electric power plant emissions	T	T	909	910	911	912
3. All other	A	A	913	914	915	916
G. Water	K	K	917	918	919	920
H. Solid waste	E	E	921	922	923	924
I. Other	D	D	925	926	927	928
J. Total of F through I	929	930	931	932	933	934

Item 11 — PRODUCT VERSUS PROCESS APPLIED RESEARCH AND DEVELOPMENT
Allocate the total applied research and development dollar figures of item 4B3, column 4, to product, process, or unclassifiable R&D. (If company records do not reveal exact data for this item, please submit your best estimate for the allocation.)

	Thousands of dollars		
	1983	1984	1985
A. Product research and development		NOT ASKED	951
B. Process research and development			952
C. Unclassifiable as to product or process		A	953
D. Total (Sum of A through C)		K E D	954

Item 12 — LONG VERSUS SHORT TERM RESEARCH AND DEVELOPMENT COSTS
Allocate the total R&D dollar figures of item 4C, columns 2 and 4, "Federal" and "Total" based on the actual and estimated future life of each of your projects in the R&D cycle, into the following three categories. (If company records do not reveal exact data for this item, please submit your best estimate for the allocation.)

	Thousands of dollars			
	1983		1984	1985
	Federal	Total		Federal
A. Projects whose total life in the R&D cycle is less than or equal to 2 years			NOT ASKED	961
B. Projects whose total life in the R&D cycle is more than 2 years but less than or equal to 5 years			A	962
C. Projects whose total life in the R&D cycle is more than 5 years			E D	963

SECTION III — RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS
(Not included in item 4.)

Item 13 — TOTAL COMPANY FUNDS FOR RESEARCH AND DEVELOPMENT ACTIVITIES FINANCED BY THE COMPANY BUT PERFORMED BY OTHERS OUTSIDE THE COMPANY WITHIN THE UNITED STATES
Include other industrial firms, colleges and universities, nonprofit organizations, etc. Exclude subcontracting of Federal government and other contracts. (See instruction manual)

	Thousands of dollars		
	1983	1984	1985
		NOT ASKED	971

Item 14 — TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED BY FOREIGN SUBSIDIARIES OR BY OTHER ORGANIZATIONS OUTSIDE THE UNITED STATES

	Thousands of dollars	
	1984	1985
	972	973

Item 15 — STATUS OF THIS COMPANY ON DECEMBER 31, 1985

A. Was the company listed in the address label owned or controlled by another company on December 31, 1985? ☐ Yes — Complete item 15B ☐ No

B. New owner information

Name _____ Date acquired _____

Address (Number and street) _____

City _____ State _____ ZIP code _____

REMARKS — If more space is required, continue on reverse.

Item 16 — CERTIFICATION — This report is substantially accurate and has been prepared in accordance with instructions.

Key	Name of person to contact regarding this report — Print or type	Mo	Day	Year
981				
	Telephone _____	Signature of authorized official _____		
983	Area code _____ Number _____ Extension _____			

NOTICE — Your report to the Census Bureau is confidential by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

**CENSUS
USE
ONLY**

SURVEY CODE

4001

INDUSTRY CODE

WEIGHT

STATE

ADDRESS

SIC CODE

RETURN TO:
Bureau of the Census
1201 East Tenth Street
Jeffersonville, IN 47132

Name of person who supplied 1985 data

Data supplied in items 1A and 1B and in item 4C, columns 2 and 4, for 1986 on this form, will satisfy the mandatory reporting requirement of Census Form MA-121 (title 13, U.S. Code). Your cooperation on the other items is essential to make the results of this survey comprehensive, accurate, and timely.

FORM RD-1
(4-11-86)
**SURVEY OF INDUSTRIAL RESEARCH AND
DEVELOPMENT DURING 1986**

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER** (11 digits) ▶

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

PLEASE RETURN THIS COPY
(Please correct any error in name and address, including ZIP Code)
GENERAL INSTRUCTIONS

- Please complete this form and return within 60 days in the envelope provided. Retain the file copy for your records. THIS REPORT SHOULD COVER YOUR ENTIRE COMPANY, INCLUDING ALL SUBSIDIARIES, UNLESS OTHERWISE DESIGNATED AND EXPLAINED IN REMARKS.
- Enter 0 (zero) where appropriate rather than leaving a blank space.
- Reasonably accurate estimates are acceptable.
- Figures for 1985 are those reported by your company last year. THE 1985 FIGURES SHOULD BE REVISED, IF NECESSARY, TO BE COMPARABLE WITH 1986 DATA.
- Explain in "Remarks" on the reverse side any substantial increases or decreases in 1986 figures over 1985 (e.g., new government contracts, acquisitions, mergers, divestitures, etc.)

PLEASE READ ENCLOSED INSTRUCTION MANUAL BEFORE COMPLETING THIS FORM
SECTION I — GENERAL COMPANY DATA
Item 1 — DOMESTIC SALES, RECEIPTS, AND EMPLOYMENT FOR COMPANY
A. Domestic net sales and receipts of this company (Thousands of dollars)

1985	1986
101	102
103	104

B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1985 and 1986
SECTION II — RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY IN THE UNITED STATES
(Exclude R&D financed by the company but performed by others. Report such R&D in section III.)
Item 2 — RESEARCH AND DEVELOPMENT EXPENDITURES
Are research and development expenditures for entire domestic company, including subsidiaries, reported on this form?
☐ YES ☐ NO — Please explain in remarks or on transmittal letter

Item 3 — NUMBER OF SCIENTISTS AND ENGINEERS INVOLVED IN RESEARCH AND DEVELOPMENT ACTIVITIES

Apportion on a full-time equivalent basis. (See instruction manual)

January 1986	January 1987
113	114

TOTAL
Item 4 — COSTS INCURRED FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY BY MAJOR TYPE AND SOURCE OF FUNDS

Include R&D depreciation and overhead; exclude R&D capital expenditures. (See instruction manual)

A. Basic research If "None," please mark (X) ☐
B. Applied research and development

1. Applied research

2. Development

3. TOTAL (Sum of lines 1 and 2)

C. TOTALS (Sum of A and B3)

D. 1985 TOTALS
E. Company and other funds, except Federal, budgeted for the year 1987

Thousands of dollars			
1985	1986		
TOTAL research and development (1)	Federal funds (2)	Company and other funds, except Federal (3)	TOTAL (Sum of columns 2 and 3) (4)
201	202	203	204
211	212	213	214
221	222	223	224
231	232	233	234
	242	243	244
	252	253	254
		263	

Item 5 — RESEARCH AND DEVELOPMENT BY FUNCTIONAL CATEGORY

Of the total reported in item 4C, columns 2 and 4, report the following functional categories.

ENERGY RESEARCH AND DEVELOPMENT

Include the project cost or portion of project cost incurred for the purpose of increasing energy resources or capabilities. Include cost by type of energy.

A. Total nuclear
B. Total fossil fuels
C. Total geothermal, solar, conservation and utilization
D. All other energy
E. Total of A through D
POLLUTION ABATEMENT RESEARCH AND DEVELOPMENT

Include the project cost or portion of the project cost incurred for the purpose of designing pollution abatement products or product characteristics or of designing pollution abatement features into processes.

Total

Thousands of dollars					
1985		1986		1987	
Federal funds	Total funds	Federal funds	Total funds	Projected Federal funds	Projected total funds
801	802	803	804	805	806
815	816	817	818	819	820
853	854	855	856	857	858
871	872	873	874	875	876
877	878	879	880	881	882

Thousands of dollars					
1985		1986		1987	
Federal funds	Total funds	Federal funds	Total funds	Projected Federal funds	Projected total funds
929	930	931	932	933	934

SECTION III — RESEARCH AND DEVELOPMENT PERFORMED OUTSIDE THE DOMESTIC COMPANY WITH COMPANY FUNDS
(Not included in item 4.)
Item 6 — TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED BY FOREIGN SUBSIDIARIES OR BY OTHER ORGANIZATIONS OUTSIDE THE UNITED STATES

Thousands of dollars	
1985	1986
972	973

CONTINUE ON REVERSE SIDE

Item 7 — STATUS OF THIS COMPANY ON DECEMBER 31, 1986**A. Was the company listed in the address label owned or controlled by another company on December 31, 1986?**

- ☐ Yes — Complete item 7B
☐ No — Skip to item 8

B. New owner information

Name 985		Date acquired 986
Address (Number and street) 987		
City 988	State 989	ZIP Code 990

REMARKS

991

Item 8 — CERTIFICATION — This report is substantially accurate and has been prepared in accordance with instructions.

Key	Name of person to contact regarding this report — Print or type			Mo.	Day	Year
992						
	Telephone		Signature of authorized official			
	Area code	Number	Extension			
993						

FORM **RD-1A**
(9-86)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
COLLECTING AND COMPILING AGENT FOR
THE NATIONAL SCIENCE FOUNDATION

**SURVEY OF INDUSTRIAL RESEARCH
AND DEVELOPMENT DURING 1986**

RETURN
TO

Bureau of the Census
1201 East Tenth Street
Jeffersonville, IN 47132

GENERAL INSTRUCTIONS

Please complete and return this form in the envelope provided within 60 days. Retain the file copy for your records. This report should cover your entire company, including all subsidiaries and affiliates, unless otherwise designated.

Enter "None" where appropriate rather than leaving a blank space.

Reasonably accurate estimates are acceptable.

PLEASE READ INSTRUCTIONS AND DEFINITIONS ON REVERSE SIDE BEFORE COMPLETING THIS FORM.

NOTICE — Your report to the Census Bureau is **confidential** by law (title 13, U.S. Code). It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are **immune from legal process**.

Item 1 — NAME AND ADDRESS OF COMPANY — Please correct any error in name and address, including ZIP Code

Group	Survey
4	4001

PLEASE RETURN THIS COPY

CENSUS USE ONLY	1	2	3	4	5	6
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Data supplied in item 2 and in item 4A, columns 2 and 4, for 1986 on this form will satisfy the mandatory reporting requirement of Census Form MA-121 (title 13, U.S. Code).

Item 2 — SALES AND EMPLOYMENT FOR COMPANY

1986

Thousands of dollars

A. Domestic net sales of all products (or receipts for service)

102

B. Total domestic company employment in all activities during the pay period which includes the 12th of March 1986

Number

104

Item 3 — NUMBER OF RESEARCH AND DEVELOPMENT SCIENTISTS AND ENGINEERS (See instructions on reverse side)

January 1987

114

Item 4 — COST OR RECEIPTS FOR RESEARCH AND DEVELOPMENT PERFORMED WITHIN THE COMPANY

Thousands of dollars

A. 1986 TOTALS

Federal
funds
(2)

Company and
other funds,
except Federal
(3)

TOTAL
(Sum of
columns 2 and 3)
(4)

242

243

244

B. Company and other funds, except Federal, budgeted for the year 1987

263

Item 5 — TOTAL COMPANY FUNDS SPENT FOR RESEARCH AND DEVELOPMENT ACTIVITIES PERFORMED OUTSIDE THE COMPANY BUT WITHIN THE UNITED STATES

1986

971

Item 6 — STATUS OF THIS COMPANY ON DECEMBER 31, 1986

A. Was the company listed in item 1 owned or controlled by another company on December 31, 1986?

☐ Yes — Complete item 6B

☐ No

B. New owner information

Name
985

Date acquired
986

Address (Number and street)
987

City
988

State
989

ZIP code
990

Please continue on reverse →

INSTRUCTIONS AND DEFINITIONS FOR SURVEY OF INDUSTRIAL RESEARCH AND DEVELOPMENT DURING 1986

General Instructions — Figures reported on sales and employment (items 2A and B) should cover your entire company, including all subsidiaries and affiliates, unless otherwise designated. The sales figures should exclude excise taxes and other discounts and allowances such as freight charges. The cost figure reported should cover the calendar years if at all possible. Please report your employment data (items 2B and 3) for the period prescribed on this report form.

Geographic Area Covered — The data are intended to relate to business firms in the fields of manufacturing, minerals, and other economic areas which operate one or more establishments in one or more of the 50 States or the District of Columbia.

Scientists and Engineers — Scientists and engineers for this survey are defined as all persons engaged in scientific or engineering work at a level which requires a knowledge of physical or life sciences or engineering or mathematics equivalent at least to that acquired through completion of a 4-year college course with a major in these fields, regardless of whether they held a college degree in the field.

Report the number assigned to research and development. If the scientists and engineers work on research and development and other activities, the figure reported should be based on the proportion of the total time that is devoted to research and development.

Research and Development — Research-development includes basic and applied research in the sciences (including medicine) and in engineering, and design and development of prototype products and processes. It does not include quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, or other nontechnological activities or technical service.

Cost of Research and Development Work Performed Within the Company — All costs incurred within the company for wages and salaries, direct material costs, services and supporting costs, and an appropriate share of company overhead to conduct research and development activities. If you did research and development for others, include the total amount charged for such work.

Under Federal funds, include research and development in procurement as well as research and development contracts and research and development subcontracts. Exclude research and development subcontracted to others.

If the company has a separate research-development organization, please exclude the estimated cost of any nonresearch-development activities conducted by that unit; include the approximate cost of research-development activities of company laboratories of technical groups not part of the research organization.

Company Funds Spent in Research and Development Done Outside Your Company — Include in this item payments, in the form of contracts, grants, fellowships, etc., made to commercial laboratories and consultants, educational institutions, hospitals, and research institutions for research and development activities. Please do not include subcontracting of Federal Government contracts or contracts received from other companies. (To do so would cause duplication in the total figure for the survey.)

If you have questions regarding reporting problems on this form, please write to the Bureau of the Census, Industry Division, Washington, D.C. 20233 or call Area Code (301) 763-5598.

Remarks

991

Item 7 — CERTIFICATION — This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report

992

Telephone (Area Code, number, extension)

993

Address (Number and street, city, State, ZIP Code)

Name of company

Address (Number and street, city, State, ZIP Code)

Signature of authorized official

Title

Date

FORM **MA-121**
(7-9-86)U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS**COMPANY SUMMARY OF
RESEARCH AND
DEVELOPMENT
1986****NOTICE** — Response to this inquiry is required by law (title 13, U.S. Code, sections 131, 182, 224, and 225). By section 9 of the same law, your report to the Census Bureau is **confidential**. It may be seen only by sworn Census employees and may be used only for statistical purposes. The law also provides that copies retained in your files are **immune from legal process**.

(Please correct any error in name and address including ZIP Code)

Group	Survey
4	9901

**RETURN
TO**Bureau of the Census
ATTN: Industry Division
Washington, D.C. 20233

Please complete and return this form in the return envelope not later than 15 days after you receive it. Companies with no research and development expenditures should so state in the "Remarks" section, fill in items 1a and 1b, sign, and return the form.

PLEASE RETURN THIS COPY**PLEASE READ INSTRUCTIONS ON REVERSE SIDE BEFORE COMPLETING YOUR REPORT****Item 1 — SALES AND EMPLOYMENT FOR COMPANY**

(Thousands of dollars)

102

a. Domestic net sales and receipts of this company and its subsidiaries during 1986

Number of employees

104

b. Number of employees in this company in all activities in the 50 States and the District of Columbia during the pay period which includes the 12th of March 1986

1986 (Thousands of dollars)		
Federal funds (2)	Company and other funds, except Federal (3)	TOTAL (Sum of columns 2 and 3) (4)
242	243	244

**Item 2 — COST OR RECEIPTS FOR RESEARCH AND
DEVELOPMENT PERFORMED WITHIN THE
COMPANY DURING 1986**Remarks
991**Item 3 — STATUS OF THIS COMPANY ON DECEMBER 31, 1986**

a. Was the company listed in Item 1 owned or controlled by another company on December 31, 1986?

☐ Yes — Complete
item 3B☐ No

b. New owner information

Name 985		Date acquired 986
Address (Number and street) 987		
City 988	State 989	ZIP Code 990

Please continue on reverse →

► GENERAL INSTRUCTIONS

A report should be filed by each company receiving a copy of this form. If your company does not conduct research and development, so state in remarks, fill in items 1a and 1b, sign, and return the form. If you have questions regarding reporting problems on this form, please write to the Bureau of the Census, Industry Division, Washington, D.C. 20233.

Report for your entire company — Research and development activities for your entire domestic company should be reported.

Period covered by report — The cost figure reported should cover the calendar year if at all possible. However, fiscal year data are acceptable, provided your fiscal year ends between September and March.

► DEFINITION OF RESEARCH AND DEVELOPMENT

Research-development includes basic and applied research in the sciences (including medicine) and in engineering, and design and development of prototypes, products, and processes. It does not include quality control, routine product testing, market research, sales promotion, sales service, research in the social sciences or psychology, or other nontechnological activities or technical services.

► SPECIFIC INSTRUCTIONS BY ITEM

Item 1 — Sales and Employment for Company.

In item 1a, report the net billings of this company and its subsidiaries to customers outside the company. (Exclude domestic intra-company transfers and sales by foreign subsidiaries, however.) In item 1b, report the number of persons employed by the company in all activities in the 50 States and the District of Columbia during the pay period which includes the 12th of March 1986.

This figure would be the same as that shown by the company in item 1 of Treasury Form 941, if the company filed one form 941 for the entire company.

Item 2 — Show all costs incurred within the company for wages and salaries, direct material costs, services and supporting costs, and an appropriate share of company overhead to conduct research and development activities.

Under Federal funds, include research and development in procurement as well as research and development contracts and research and development subcontracts. Exclude research and development subcontracted to others.

Remarks (Continued)

991

Name of person to contact regarding this report 992	Address (Number and street, city, State, ZIP Code)	Telephone (Area code, number, extension) 993
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► **CERTIFICATION** — This report is substantially accurate and has been prepared in accordance with instructions

Name of company	Address (Number and street, city, State, ZIP Code)	
Signature of authorized official	Title	Date